The RUBBER AGE

March, 1946

TECHNOLOGY DEPT:

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Agerite Stalite

DURING the war the entire output of this new AGERITE was used in GR-S but it is now readily available for general use.

AGERITE STALITE is a free-flowing oil-like liquid, non-toxic and easily incorporated in natural or synthetic rubbers. It is an excellent all-round antioxidant and flexing improver and next to AGERITE ALBA is the least discoloring and staining of the AGERITES. It fills a distinct need in the rubber industry and is of wide application.

R. T. VANDERBILT CO., INC.

230 Park Avenue, New York City

Du Pont
NEWSLETTER No. 3, MARCH 1946
RUBBER CHEMICALS DIVISION
PUBLISHED BY E. I. DU PONT DE NEMOURS & CO. (INC.), WILMINGTON 98, DELAWARE

THE MANUFACTURE OF NEOPRENE INNER TUBES

Premium quality inner tubes are now being made from neoprene. They retain air many times better than natural rubber tubes. They do not grow excessively and, consequently, do not develop folds or thin spots, even when transferred several times from old to new casings. They are resilient and extremely resistant to pinching, chafing and tearing. They can be cold or hot patched with ease. Their heat and age resistance is unsurpassed. These conclusions have been drawn from the results of extensive road and wheel tests which have not yet been published.

RED, BLACK, ORANGE, or any other desired color tubes can be made from neoprene. Since these tubes are now in commercial production, factory processing techniques are well developed. Banbury mixing is recommended, but processing on open mills gives satisfactory results. Straining is not normally required. Tubing is usually carried out with a cold screw, barrel, head and die. A warm die may be used for greater smoothness. A neoprene, GR-S, butyl or natural rubber stem can be used.

Recommended Formulas and Procedure

	Red Tube	Black Tube	
Neoprene GR-M-10, P-3	100.0	100.0	
NEOZONE A	1.0	1.0	Antioxidant
Stearic Acid	2.0	3.0	Lubricant and retarder
Ex. Lt. Calc. Magnesia	4.0	4.0	Curing and processing aid
Fine Particle Whiting	35.0	—	Filler—low set
SRF Carbon Black	—	40.0	Filler—good tear
Sodium Acetate	1.0	1.0	Retarder at processing temperature
Petrolatum	3.0	3.0	Softener & Lubricant
Silene EF	15.0	—	Filler—good tear
Light Process Oil	2.0	6.0	Softener
RUBBER RED 28	0.7	—	Color
RUBBER ORANGE F	0.3	—	Color
Zinc Oxide	5.0	5.0	Curing Agent
PERMALUX	1.0	—	Accelerator
	170.0	163.0	

Inner Tube Processing—General

Uncured neoprene is thermoplastic and becomes soft if overmilled. The operator soon learns that he will have very little trouble if he handles his stock properly in the shortest possible time. This results in greater production per man and machine hour.

Compounding materials can be dispersed into neoprene rapidly before it becomes too soft, and experience soon teaches that continued milling should be avoided after mixing is complete. For this reason, Banbury mixing is preferred to mill mixing. Banbury rotor speeds, ranging from 20 rpm to 40 rpm, have proved satisfactory. The so-called "upside-down mix", in which the dry pigments are added to the Banbury before the neoprene, has produced satisfactory stocks under factory conditions with the compounds described. As with natural rubber, properly cooled mixing equipment is essential.

NEOPRENE STOCKS do not normally require straining, but if contamination during mixing makes this necessary, the zinc oxide should not be added until straining is completed. The stock should flow continuously through the strainer.

For more detailed information on the manufacture of inner tubes, write for our technical report BL-206.

Buy Victory Bonds

DU PONT
BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

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TECHNOLOGY DEPT:

UBLIC LIBRARY
APR 3 1946
DETROIT

HYCAR SYNTHETIC RUBBER PRICES REDUCED AGAIN!

Now . . . HYCAR OR-25 available at the same volume cost as Government GR-M

For the 6th time in 5 years the prices of HYCAR synthetic rubbers have been reduced.

But more important, the current reduction makes possible the use of HYCAR OR-25—with its superior oil resistance, storage stability, and compounding advantages—at a volume cost equal to GR-M. Prices of HYCAR OR-15 and HYCAR OS-10 have also been reduced.

The following table gives complete information on prices of all three HYCAR synthetic rubbers.

HYCAR Domestic Price Schedule • Effective March 1st

	DRY RUBBER			LATEX			
	Price per Lb. Carloads of 60,000# Min.	Price per Lb. LCL—1000# to Carload	Price per Lb. LCL 100# to 900#	Price per Lb. in Buyer's Tank Cars	Price per Lb. Drums—Carload Min. of 100 Drs.	Price per Lb. LCL 6 to 99 Drums	Price per Lb. LCL 1 to 5 Drums
HYCAR OR-25	$0.36	$0.365	$0.385	$0.345	$0.365	$0.375	$0.395
HYCAR OR-15	0.43	0.435	0.455	0.415	0.435	0.445	0.465
HYCAR OS-10	0.36	0.365	0.385	0.345	0.365	0.375	0.395

Minimum freight allowed east of Rocky Mts.
Standard Container—100# carton.

Minimum freight allowed east of Rocky Mts.
The above latex prices are based on the total solids content, which, in general, is approximately 40%.
Standard Container—55-gallon non-returnable drums.

West coast prices slightly higher, ex-warehouse, Los Angeles.

FOR ADDITIONAL INFORMATION PLEASE WRITE DEPARTMENT HD-3, B. F. GOODRICH CHEMICAL COMPANY, ROSE BUILDING, CLEVELAND 15, OHIO

Hycar
Reg. U.S. Pat. Off.

LARGEST PRIVATELY PRODUCED BUTADIENE TYPE

Synthetic Rubber

B. F. Goodrich Chemical Company
A DIVISION OF THE B. F. GOODRICH COMPANY

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SURE NUFF... IF YOU USE PHILBLACK A!

We mean it! Philblack A increases resistance to cut and crack growth *remarkably!* Gives you a compound that can take it . . . a better product! An increasing number of manufacturers are using this new HMF-type carbon black to improve the wearing qualities and increase the life of their tires and tubes. Try Philblack A in your products and see what miracles this "black magic" can work for you!

PHILLIPS PETROLEUM COMPANY

Philblack Division

EVANS SAVINGS AND LOAN BUILDING · AKRON, OHIO

We'll hang our story on a clothesline

Desirable properties suggest uses for **GEON** *raw materials in every industry*

★

THAT clothesline in the picture is something new. It consists of a flexible rope or metal core, covered with one of the GEON polyvinyl materials. It has certain definite advantages over conventional clotheslines—all of which can be translated into improved finished products in literally every industry and in the home.

For example, the clothesline is practically age-proof—resists the effects of sun, rain, light, heat, cold. It won't crack or get gummy even after prolonged exposure to weather. It's easily cleaned with a damp cloth—no dirt or grime can penetrate it. It's mildew-proof—fungi can't enter the surface. It will wear indefinitely—pull it around hooks thousands of times—no snagging, no breaking of the tough coating. It's smooth, flexible, easy to handle. It's brightly colored for high visibility and attractive appearance.

Consider those properties—plus others such as excellent electrical properties and resistance to acids, oils, and chemicals—in light of the fact that GEON can be extruded, pressure or injection molded, used as coatings for fabric or paper, calendered or cast into sheet or film. *The number of established and potential applications in every field is literally limitless.* For more information about GEON polyvinyl raw materials or for help with specific applications, please write Dept. K-3, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, O.

Here are a few applications for GEON suggested by the clothesline

Textile coatings for rainwear, awnings, industrial aprons.

Calendered, embossed sheet for upholstery and luggage.

Calendered or molded sheet for flooring, shoe soles, shower mats.

Paper coatings or film for packaging, wall covering.

Extruded wire and cable insulation.

Geon
Polyvinyl Materials

B. F. Goodrich Chemical Company

A DIVISION OF THE B. F. GOODRICH COMPANY

For low heat build-up
and freedom from scorch
with natural and synthetic rubbers

Activated
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Good-rite ACCELERATORS

For complete technical data please write Department RB-3

B. F. Goodrich Chemical Company
A DIVISION OF THE B. F. GOODRICH COMPANY

ROSE BUILDING, CLEVELAND 15, OHIO

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PHENOLIC RESINS for the rubber industry

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FOR BUNA N TYPE SYNTHETIC RUBBERS

SYNVARITE RC resins for Buna N type synthetic rubbers are thermosetting phenolics, compatible with the elastomer in all proportions. This affords an opportunity to combine the qualities of both resin and plastic to obtain a wide range of new properties.

2
FOR GR-S

SYNVARITE RC 50 for GR-S is a thermoplastic resin, designed to impart tack to the compound.

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REG. U. S. PAT. OFFICE

Also available—A complete line of standard urea formaldehyde and phenol formaldehyde resins.

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It's wise indeed to consider economy and reliability when selecting reclaims; so before you decide on Buffalo Reclaim —or any other reclaim—examine the record carefully. In favor of BUFFALO you'll find 63 years of experience and research; you'll find that BUFFALO subjects ALL its reclaims to rigid laboratory control . . . to insure that you get high-quality uniform grades.

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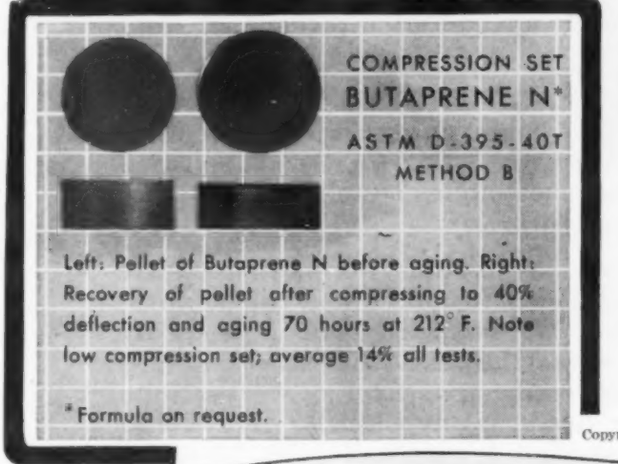
63 Years Serving the Industry Solely as Reclaimers

LOW COMPRESSION SET

ANOTHER *PLUS VALUE* OF

Butaprene N



Left: Pellet of Butaprene N before aging. Right: Recovery of pellet after compressing to 40% deflection and aging 70 hours at 212° F. Note low compression set; average 14% all tests.

*Formula on request.

LOOKING for a gasket rubber that assures a *permanent* seal? One that's ideal for swabs, sleeves, packings, diaphragms and similar tight-fitting parts operating in hydraulic fluids or oils? Then specify *Butaprene N*, the oil-resistant synthetic by Firestone. For low compression set is one of the *outstanding* physical properties of this new Firestone polymer. No other synthetic compares with Butaprene N in this vital characteristic.

But low compression set is only one of the many PLUS values you get in BUTAPRENE N. These Butaprene polymers are practically unaffected by oils or fuels; will withstand tropical heat or sub-arctic cold; are extremely resistant to abrasion; are tough and long-wearing. Why not look into these Butaprene N synthetics? The Butaprene Technical Staff will be glad to help with any problem involving the use of synthetic rubber in any form, latex or solid. There's no charge or obligation; simply write XYLOS RUBBER COMPANY, Akron 1, Ohio.

★

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BUTAPRENE N
by Firestone

THE SYNTHETIC RUBBER OF
A THOUSAND USES

RESISTS: OIL · GASOLINE · HEAT · SUB-ZERO COLD · AGING · ABRASION

WHEN YOU USE

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(LIQUID CONCENTRATE)

LUBRICANT

"Dust" arising from the use of soapstone, talc, etc., has long been considered a nuisance in rubber processing! Labor, time and health are all jeopardized, with no end of disorderliness and inconvenience involved.

Dip the hot rubber slabs into a GLYCERIZED solution when they are cut from the mixing mill to prevent sticking when piled. Run your extruded articles through a GLYCERIZED solution before winding on the flat pan or continuous running to eliminate adhesion during the open steam cure.

Lubrication of molds, mandrels, belt drums, air bags, etc., are all facilitated with GLYCERIZED solution. Inner tubes, automotive parts and other molded and extruded rubber goods are washed and finished readily with GLYCERIZED solution. *It is adapted to all types of synthetic rubbers, natural rubber, reclaim or mixtures.* Articles retain a glossy, satiny sheen so desirable in rubber products. Makers of insulated wire and cable have for years recognized the merits of GLYCERIZED LUBRICANT in their processing. Follow specific directions furnished with each shipment.

GET THE GENUINE from GENSEKE

Indeed, it is the consistent, year in and year out performance that has earned for GLYCERIZED its place as the *ESTABLISHED LUBRICANT IN RUBBER PROCESSING!*

AVAILABLE ONLY IN DRUMS, HALF DRUMS AND QUARTER DRUMS

QUALITY SINCE 1884

GENSEKE BROTHERS

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A NEW TRIUMPH

IN RUBBER RESEARCH!

PLIOLITE S-1

Light gravity, non-discoloring, reinforcing agent for all compounds— available now — in quantity!

IN Pliolite S-1, Goodyear Research offers you a standout reinforcing material that is not only easier to handle than carbon black, but also offers many important advantages.

Pliolite S-1 acts very effectively as a plasticizer at processing temperatures, assuring more uniform, easier-handled compounds. It positively reinforces stocks, imparting additional hardness with little loss in elongation. Being thermoplastic, it is a very helpful processing aid for smooth extrusions and molded products.

You will find Pliolite S-1 ideal for all compounds requiring a light color, low gravity stock in the range of 70-90 durometer hardness, with good processing characteristics and moldability. Because of its excellent abrasion resistance and good flex-life, it is especially desirable in soles and top lifts.

Pliolite S-1 is equally effective in GRS, Butyl and Buna-N compounds. Available now as a powder for your own mixing, or in master batches in the synthetic of your choice. For full data and sample, write: Goodyear, Chemical Products Division, Plastics & Coatings Dept., Akron 16, Ohio.

Specify
CHEMIGUM N-3
for all compounds requiring an oil-resistant HEAT-STABLE performance.

GOODYEAR

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Pliolite, Chemigum—T. M.'s The Goodyear T. & R. Co.

JIM, WHAT ABOUT WINDSHIELD RUBBER FOR THE NEW MODELS? YOU KNOW, IT MUST BE NON-STAINING AND KEEP ITS RESILIENCY IN ALL WEATHERS
DON'T WORRY, CHIEF, WE PLAN TO USE EXTRA CLEAR PELLETEX

FOR windshield rubber, sealing strips, fan belts, radiator hose and numerous other automotive products, PELLETEX and GASTEX semi-reinforcing furnace blacks are popular with experienced users of both natural rubber and synthetics.

These blacks are easy to process and have what it takes to stand up under severe conditions of weather and wear.

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PIGMENTS Chemicals

That's why Rayon Cord Tires are SAFER-BETTER

TIRE ENGINEERS will tell you that the heavier a tire is, the hotter it runs—and HEAT is the enemy of tires!

Rayon cord tires run cooler because rayon's greater strength permits a tire to be made lighter. All tires in motion develop a certain amount of heat—but the particular quality of rayon, that makes it superior for tires, is that rayon grows stronger as a tire heats up. And that's true whether the tire is made with natural rubber, synthetic rubber or combinations of both.

American motorists fall heir to this remarkable advance in tire making, proven in the laboratory of war-time performance. They can enjoy:

Greater Safety • Cooler running rayon cord tires reduce blowout danger and road failure.

Longer Wear • With heat breakdown reduced, rayon cord tires mean far greater mileage.

Easier Riding • Rayon cords flex easier, offer less rolling resistance, give a more comfortable, and more economical, ride.

Industrial Rayon produces Tyron yarn, cord and fabric by the exclusive Continuous Process which provides the highest degree of uniformity—a quality that is a first essential in tire making and tire performance. Millions of pounds of Tyron kept our armed forces rolling; now Tyron will keep America "Rolling on Rayon."

TYRON **rayon for tires**

Made by INDUSTRIAL RAYON CORPORATION
Cleveland, Ohio

Technical Bulletin No. 19

on the Compounding of GR-S with Substantial Loadings of Zinc Oxide

GR-S-10 (Rosin Soap Polymer) with 100 Parts of Zinc Oxide

"Monex" Acceleration

(Refer to Technical Bulletins No. 9, 10, 11, 13, 14, 16, and 18)

WITH "Monex" acceleration, 100 part Zinc Oxide—GR-S-10 compounds show satisfactory tensile properties and practically constant elongations over a 45 minute curing range. As with SPDX-G (Technical Bulletin No. 14), there is a definite indication of reversion. The permanent set is low and this is reflected in good heat generating properties, without adversely affecting cut-growth. The room temperature rebound is low, as is the case generally for GR-S-10 in comparison with GR-S.

COMPOUND No. 19	
GR-S-10	100.0
Sulfur	2.0
"Monex"	0.5
Coumarone-indene Resin	3.0
E.L.C. Magnesia	5.0
Zinc Oxide	100.0

ORIGINAL RESULTS

Time of Cure Min. at 45 Lb.	Tensile Strength (psi)	Per Cent Elongation	Modulus Load (psi) for Elongation of:				Permanent Set	Shore Hardness	Tear Resistance Tested at:	
			200%	300%	400%	500%			Room Temp.	100°C.
15	1930	810	215	285	430	605	.24	42	107	64
30	1630	675	260	370	520	780	.13	44	88	44
45	1580	640	265	415	565	865	.10	44	88	38
60	1520	640	265	380	535	840	.08	44	71	35
90	1520	650	220	335	480	740	.08	44	72	34

Time of Cure Min. at 45 Lb.	Goodyear-Healey Pendulum		Compression Fatigue (Goodrich Flexometer)*					Cut-Growth Resistance Room Temperature Inches Failure at
	Indentation in mm.	Per Cent Rebound	Per Cent Initial Comp.	Running Time and Per Cent Permanent Set	Max. Temp. Rise °C.	Dynamic Compression		
						Initial	Final	15,000 Cyc.
90	8.04	51.4	27.4	15'-2.9	20.3	18.5	20.0	.34

* Test Conditions: 100 lb. Load. 0.15" Stroke. 100° C. Oven Temp.

Uniform Quality HORSE HEAD ZINC OXIDES

THE NEW JERSEY ZINC COMPANY

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DOUBLE CHECK

what SYNTRON is

✓	100% WATERPROOF	☐
✓	BOILPROOF	☐
✓	SOFT & FLEXIBLE	☐
✓	ABRASION-RESISTANT	☐
✓	RESISTANT TO ACIDS, ALKALIS & CHEMICALS	☐
✓	RESISTANT TO OILS & GREASES	☐
✓	TOUGH & DURABLE	☐

and what you want

or, if you have a special coating problem ☐

Let the Gordon-Lacey research laboratories develop a custom-made SYNTRON coating, to fit your individual needs . . . a coating that is exactly right for your particular requirements, whether for cotton, rayon, nylon, fiberglass or any other fabric surface . . . and whether you service the RAINWEAR, SHOE, HOUSE FURNISHINGS, CLOSET ACCESSORIES, SPORTSWEAR, TOY or any other trade.

*TRADE MARK

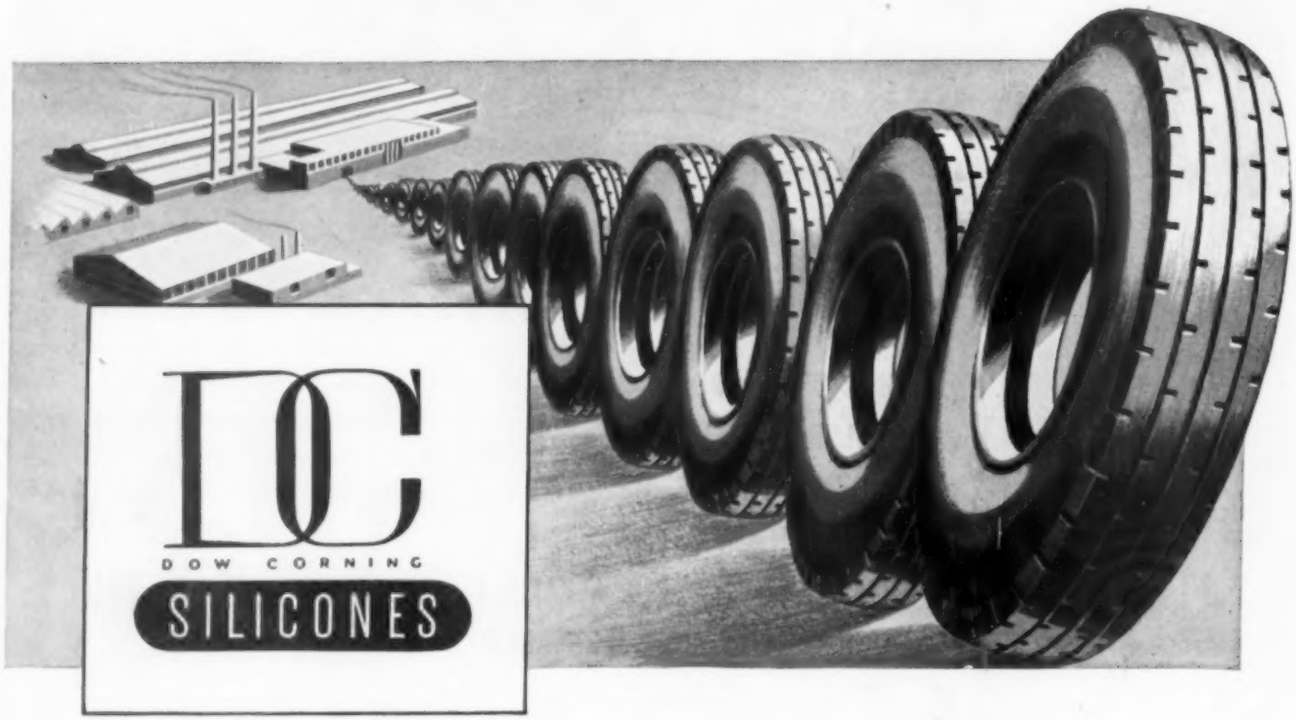
For your convenience, attach this page to your letterhead together with the story of *your* coating needs. Mail to Dept. RAM.

GORDON-LACEY CHEMICAL PRODUCTS CO.

57-02 48th STREET • MASPETH, NEW YORK

Improve quality... reduce scrap

with DC mold release fluid



It's economical—emulsions containing as little as .25% fluid are effective in some rubber molding operations

ADVANTAGES

- Reduces Percentage of Scrap
- Easy to Apply
- Does Not Build Up On Mold
- Permits Several Moldings Per Application
- Gives Smoother Moldings—Cuts Finishing Cost
- Eliminates Breaking-in Period On Clean Molds
- Acts As Rubber Preservative
- Good Dielectric
- Practically Odorless

PROPERTIES

Color	Water White
Specific Gravity at 25°C.	0.972
Boiling Point	None
Flash Point	625°F.
Volatility, 48 Hrs. at 400°F.	less than 2%
Solvents	methyl ethyl ketone, amyl alcohol, ethyl acetate, benzene, toluene, carbon tetrachloride

For further information write to Dow Corning for a copy of the leaflet 'DC Mold Release Fluid'. Information concerning emulsions of DC Mold Release Fluid will also be supplied on request.

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MIDLAND, MICHIGAN

Cleveland Office: Terminal Tower • Chicago Office: Builders' Building
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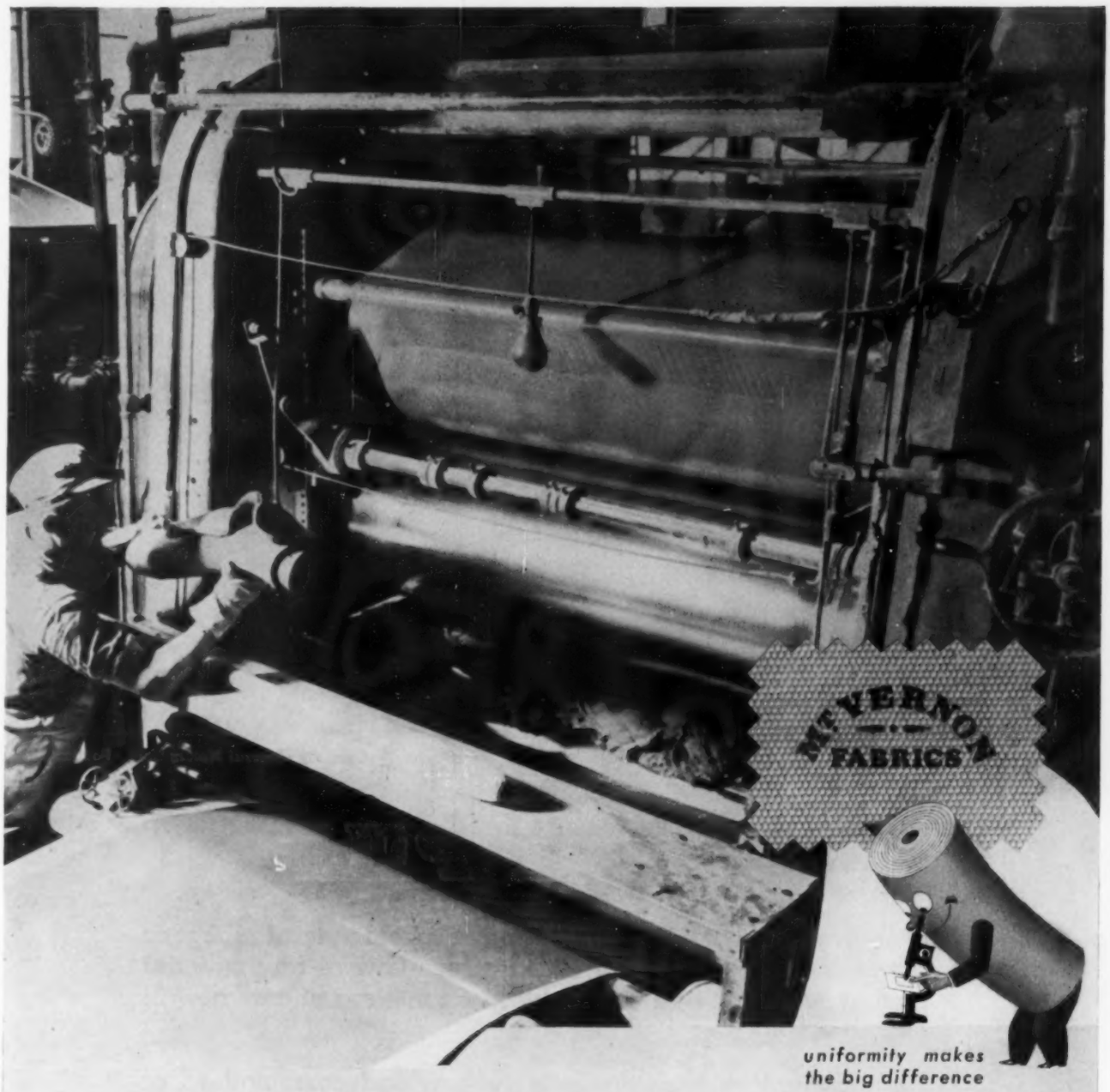
Dow Corning
FIRST IN SILICONES



uniformity makes the big difference

UNIFORM FABRICS FOR UNIFORM RUBBER PRODUCTS

Every step in the production of MT. VERNON fabrics is aimed at the uniform weave that means uniform properties of absorption, strength, toughness, resiliency, and flexibility. Close laboratory control and rigid inspection insure this dependable quality when you specify MT. VERNON top-cotton fabrics.

MT. VERNON-WOODBERRY MILLS

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Courtesy General Motors Corp., Pontiac, Mich.

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Five tires and five tubes—whether made from natural rubber or synthetic—provide us with a continuous flow of raw material as they wear out and are replaced on millions of cars now in daily use.

Such natural rubber, synthetic rubber, and combinations of both, are now going into high quality reclaims made by Pequanoc Rubber Company.

PEQUANOC RECLAIMS are always economical. They are uniform and therefore dependable, which makes them preferred by quality-minded manufacturers who must maintain high standards at low cost.

PEQUANOC RUBBER CO.

QUALITY RECLAIMS FOR SPECIFIC PURPOSES

BUTLER NEW JERSEY

DEPENDABLE— UNITED BLACKS

KOSMOBILE 77
DIXIEDENSED 77
EPC

United blacks, dependable for uniformity and performance, are the result of years of experience in carbon black making, centered in modern manufacturing plants and controlled with scientific precision. KOSMOBILE 77 and DIXIEDENSED 77—the standby EPC blacks during the war, now and in the future.

UNITED CARBON COMPANY, INC.

CHARLESTON 27, W. VA.

NEW YORK • AKRON • CHICAGO

Memorandum to—

Rubber Compounder

For perfection in reinforcement of GR-S there is nothing better than EPC black. For the perfect EPC black there is nothing superior to KOSMOBILE 77 and DIXIEDENSED 77. They are custom-made for GR-S and do equally well in other rubbers, synthetic or natural. KOSMOBILE 77 and DIXIEDENSED 77 are symbols for easy processing, cool mixing, high reinforcement and outstanding wear.

RESEARCH DIVISION

UNITED CARBON COMPANY, INC.

Charleston 27, West Virginia

Worlds Apart,

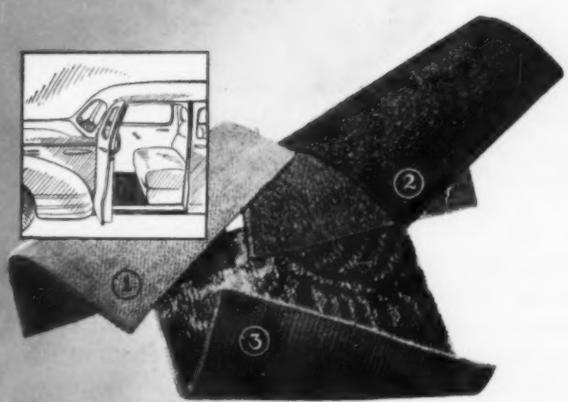
Yet born of the same parents...

Aqueous Dispersions and Research

Curled Hair Pads

used in seat and back cushions in automobiles, buses, tractors and the like.

A Flintkote SYNTEX* rubber product is used in the binder for the fibre in this resilient economical type of water, mildew and vermin resistant seat padding.



Carpet Backing

widely used in the manufacture of automotive and domestic floor coverings of special types.

(1) A Flintkote SYNTEX* rubber product is applied to pile loops and burlap backing which are adhered and vulcanized to bind the two. (2) Flintkote SYNTEX is applied to the back of the carpet, then dried and vulcanized, serving to bind the pile. (3) A Flintkote SYNTEX dispersion used with the sizing fixes the pile, gives body and handle and will also give non-skid qualities to the backing of domestic carpet when desired.

**Registered Trade Mark of Flintkote's line of Rubber Dispersions*

These examples demonstrate the ***versatility*** of ***aqueous dispersions*** — whether of rubbers or resins. For other processes Flintkote also offers a wide line of synthetic rubber and resin latices.

Why not compare notes with the Flintkote technical staff and take advantage of their 45 years of experience! Flintkote's research, development and manufacturing facilities are ***all*** at your call.

Flintkote—Products for Industry

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FLINTKOTE SYNTEX RUBBER PRODUCTS

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NEW ORLEANS · WASHINGTON · TORONTO · MONTREAL

SYNTHETIC RUBBER & RESIN COMPOUNDS

Custombuilt

FOR YOUR PRODUCT OR PROCESS

A few Applications of GENERAL LATEX Product Development

Aircraft Cements
Carpet Backing
Can Sealing
Cable and Wire
Combining Compounds
General Adhesives
Hose and Belting
Impregnating Compounds
Pile Fabrics
Protective Clothing
Shoe Adhesives
Sizings

A practical approach to the use of synthetic dispersions in your product is to refer your problem to our laboratory. No matter what the process—coating, impregnating, or bonding—our experienced technical staff can compound the material best suited to your requirements. In the case of an entirely new product, we will work out all the details of manufacturing procedure—from pilot operations to commercial production in your plant. Why not talk it over with one of our technical representatives?

GRS latex types 2 and 3, normal and concentrated, available from stock.

A Complete Service to Manufacturers

RESEARCH • MATERIALS • ENGINEERING • MANUFACTURE

General Latex & CHEMICAL CORP.

666 MAIN STREET, CAMBRIDGE, MASS.

Agents for Rubber Reserve Company for storage and distribution of natural rubber latex. Distributors for Rubber Reserve Company for synthetic latex. Operators of the Government-owned Baytown, Texas, synthetic rubber plant in collaboration with the General Tire & Rubber Co.

"Pin-Up" for '46

HERE'S an appealing vision for millions of motorists. . . White side-wall tires with red tubes—hmm-m, a gorgeous set-up for any man's money! The real thing can soon replace the vision. Red tubes of Butyl rubber are here now, thanks to SILENE EF. . . Next is the white side-wall tire. . . And that, too, is a probable "come-back" in 1946. It also will be made possible by SILENE EF. . . This fine white reinforcing pigment is assuring greater success in color compounding. It is essential in many non-black compounds to give them needed processing qualities, and the good cured physical properties unobtainable when clays or whitings are used alone as the loading pigment.

SILENE EF

STANDARD Chemical Company

General Offices: AKRON 8, OHIO

New England: 335 Chamber of Commerce Bldg., Boston, Mass.
Mid-Atlantic: Broad Street Bank Bldg., Trenton, N. J.
Mid-West: 2724 W. Lawrence Ave., Chicago, Ill.

Excellent Service Records
PAN AMERICAN WOR

EXCELLENT SERVICE RECORDS . . . on military vehicles and planes . . . on commercial trucks and buses . . . and now on airline equipment . . . testify to the important new advantages of rayon cord tires.

These records . . . including Army proving ground tests . . . show that under conditions of sustained operation and heat as well as over rough terrain, rayon cord tires give substantially better performance.

Scientific research explains rayon's superiority clearly. For rayon is stronger, of more uniform size, permits a cooler-running tire, and withstands almost infinite flexing.

That's why, in such a wide variety of services, rayon cord tires cause fewer road delays, allow higher running speeds, and provide lower operating costs, fewer maintenance problems, greater safety, and longer tire life.

with Rayon Cord Tires

RAYON CORD TIRES ACHIEVE RECORD IN SAFETY AND DEPENDABILITY . . . *Pan American World Airways*

Henry H. Berke, Assistant Vice President, Services of Supply, Pan American World Airways, states: "Successful world-wide air transport operations are tied in with dependable and safe tires. Rayon cord tires used on Pan American World Airways equipment have excellent 'Service Records' . . . have fully proved their worth."

PAA

AMERICAN VISCOSE CORPORATION

America's largest producer of rayon

Offices: 350 Fifth Avenue, New York 1, N. Y.; Charlotte, N. C.; Philadelphia, Pa.; Providence, R. I.; Washington, D. C.; Wilmington, Del.

Our free booklet, "The Record of Rayon Cord in Tires," gives dozens of interesting facts about rayon cord that make clear its importance in tires of today and tomorrow. Order your copy now. Just clip and fill in the coupon.

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350 Fifth Avenue, New York 1, N. Y.

Gentlemen:

Please send me a free copy of "The Record of Rayon Cord in Tires."

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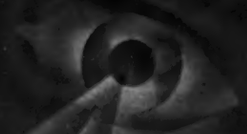
LOOKING BACKWARD...

The Muehlstein record of 45 years has been one of outstanding performance . . . of steady progress, always in tune with the fast moving development of the rubber industry.



LOOKING FORWARD...

The Rubber Industry faces many new problems which it will continue to solve in its stride; and the Muehlstein organization, as supplier of raw materials pledges its continued supporting part therein. It will always be found "in there pitching" . . . maintaining its position of

Leadership THROUGH *Ability and Stability*

H. MUEHLSTEIN & CO. INC.

122 EAST 42nd STREET, NEW YORK 17, N. Y.

LOS ANGELES: 1431 E. 16 St. • MEMPHIS: 46 W. Virginia Ave. • CHICAGO: 327 So. La Salle St. • AKRON: 250 Jewett St. • BOSTON: 31 St. James Ave.

SPHERON 9

Quality always has been, still is, the Cabot guide for the production of Carbon Blacks. Spheron 9 is an example. Today, this easy processing Channel Black is the same which Cabot produced before and during World War II.

These high standards for Spheron 9 were set long before the outbreak of hostilities. They were met rigidly during the difficult years when the urgent need for this vital raw material might have seemed sufficient excuse to relax. Cabot did not relax.

With Cabot this principle was a policy. Its wisdom was proved when GR-S appeared, for then it was found that Spheron 9 in GR-S was the identical EPC Black of peacetime—reliable, invariable, dependable.

The same rule is applied today, time after time, in the counsels of the Cabot Company. Quality and uniformity are the standards.

GODFREY L. CABOT, INC.

77 FRANKLIN ST., BOSTON 10, MASS.

MAKES SHAPING AND BAGGING EASY AS 1-2-3!

Airbag is placed on ram-hook of National Pressure Shaper and Bagger.

With airbag drawn up in ram, tire is placed in position.

Downstroke shapes tire and bags it simultaneously.

THIS machine makes your toughest job *easy* by taking the heavy labor out of shaping and bagging. Operator fatigue is lessened. Workers are released from a hard, grueling operation for less difficult, more productive work. Spread cords resulting from faulty manual bagging are eliminated. You get *faster,* more *economical* production when you use the new electrically controlled National Pressure Shaper and Bagger.

Machines are now being built in two sizes to bag and shape all passenger and volume-produced truck tires as fast as the tires can be handled. Small size for passenger car and commercial tires up to 7.50″x20″. Larger size for 32″x6″ to 12.75″x24″. Write today for full details.

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General Offices: AKRON 11, OHIO

Creative Engineering

A MODERN MIRACLE

Sprung from

EMPTY FIELDS,

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JOURNALS AND

THE MINDS OF MEN

"GR-S" Latex

We solicit your inquiries

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Naugatuck Chemical Division

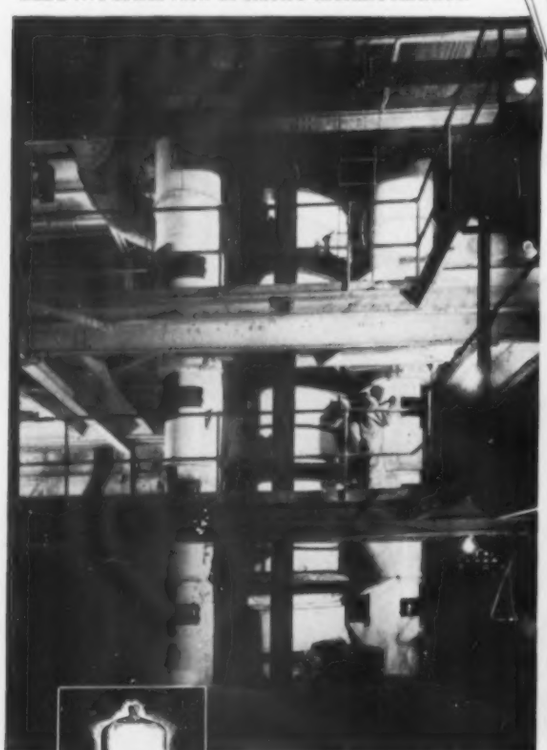
1230 AVENUE OF THE AMERICAS • NEW YORK 20, N. Y.

BRANCHES: AKRON · BOSTON · DETROIT · NAUGATUCK

ST. JOE *Lead-Free* ZINC OXIDE

ABOVE: *A stope in the Balmat mine.*

BELOW: *Partial view of electro-thermic furnace.*



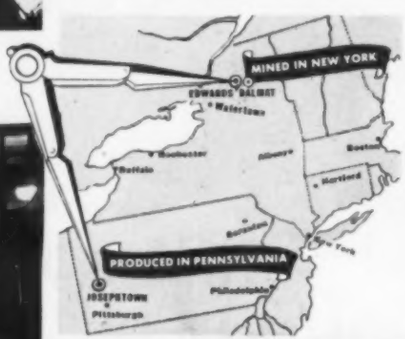
Controlled QUALITY AND UNIFORMITY from ORE to OXIDE

The ore from which St. Joe Zinc Oxides are produced originates in the northern part of New York where the St. Joseph Lead Company owns and operates zinc mines at Edwards and Balmat, St. Lawrence County.

After mining and milling, the zinc concentrates are shipped to the Company's smelter at Josephtown, Pa., where St. Joe Zinc Oxide is produced by a patented electro-thermic process—exclusive with the St. Joseph Lead Company.

This unity of control in production from ore to oxide is largely responsible for the product's exceptionally high purity and uniformity, and explains why St. Joe lead-free Zinc Oxides have become justly famous in the consuming industries.

From Josephtown, Pa. the finished zinc oxides, packed in paper bags and wooden barrels, are shipped to all consuming industries in the country—Josephtown being centrally located, geographically, as far as the major consumption of Zinc Oxide is concerned. In addition, stocks of St. Joe lead-free Zinc Oxides are warehoused in the principal cities of the United States.



•

BELOW: *Section of our Zinc Oxide storage warehouse.*

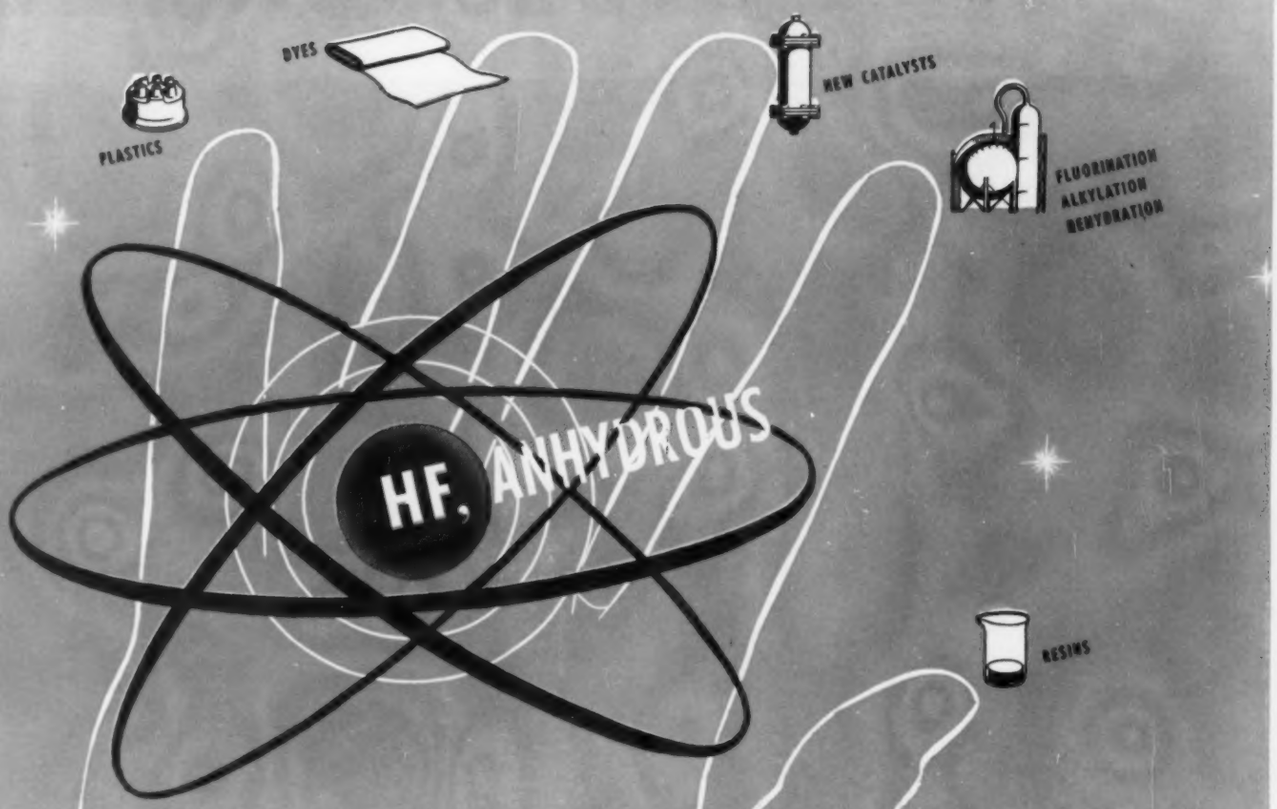
ST. JOSEPH LEAD COMPANY

250 PARK AVENUE, NEW YORK 17

ELdorado 5-3200

PLANT AND LABORATORY: JOSEPHTOWN, BEAVER COUNTY, PENNSYLVANIA

reaching out to tomorrow...



ACYLATION • ISOMERIZATION • POLYMERIZATION

Industry's tomorrows merge with today as chemists and engineers find new and important applications for Anhydrous Hydrofluoric Acid. Research and development now point to many uses for this versatile chemical—as a catalyst for alkylation, acylation, isomerization and polymerization reactions; as a dehydrating agent and condensation reagent, as a fluorinating agent, etc.

The potentialities of Anhydrous HF have already been tapped by the petroleum and refrigeration industries. Ahead are opportunities for even greater usefulness for synthesis in the plastic, dye, resin and other industries built on organic chemical processes.

Organizations whose research, process planning or manufacturing programs utilize Anhydrous HF—or show need for a chemical of its characteristics—are invited to avail themselves of the services of the General Chemical Fluorine Division. At your disposal will be the experience, resourcefulness and technological "know how" of a company that pioneered in bringing this product out of the laboratory into the industrial forefront.

General Chemical Technical Service Bulletin 30-A, "Hydrofluoric Acid, Anhydrous and Aqueous," presents many important original data. It contains 24 pages of curves, charts, bibliography, etc., with special emphasis on the physical and chemical properties of Anhydrous HF and its use in organic syntheses. Copies may be obtained from the nearest General Chemical Sales and Technical Service Office below, or General Chemical Company, Fluorine Division, Dept. OGJ-10, 40 Rector Street, New York 6, N. Y.

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FOR AMERICAN INDUSTRY

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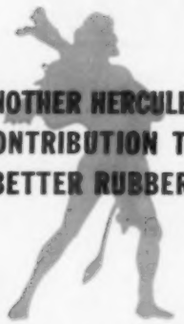
IT PAYS TO KNOW *MORE* ABOUT

HERCULES

WITHOUT SCORCH!



ANOTHER HERCULES CONTRIBUTION TO BETTER RUBBER

Extensive tests, made at the Hercules rubber testing laboratory, show conclusively that by using litharge with Hercules rosin-type softeners in the milling of GR-S and GR-S-10, the curing time for these compounds may be accelerated considerably over that for similar unleaded compounds. Yet, at the same time, resistance to heat embrittlement is increased, and the tendency toward scorchiness is markedly reduced.

These tests were conducted on leaded and unleaded tire tread compounds employing the following softeners: Staybelite* Resin, Resin 733, N Wood Rosin, asphalt, coal tar, and pine tar. The compounds that contain rosin-type softeners, notably Resin 733 and Staybelite Resin, showed much greater improvement through the addition of lead than the other softeners tested.

The results of these tests may be a valuable aid in obtaining for *your* synthetic compounds the most desirable combination of properties inherent in rosin-type softeners and litharge. Return coupon for your copy and for technical details on Hercules Staybelite Resin and Resin 733.

*Reg. U. S. Patent Off. by Hercules Powder Company

CHEMICAL MATERIALS FOR THE RUBBER INDUSTRY

Other Hercules chemical materials for the rubber industry include:

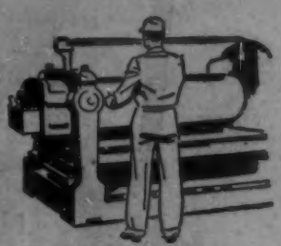
Solvenol*...
A strong solvent for rubber, with a slow rate of evaporation. Widely used in rubber reclaiming.

Staybelite* Esters...
Low-cost tackifiers, compatible with all synthetic rubbers. Valuable in pressure-sensitive adhesives.

Chemical Cotton...
Basis for the toughest high-tenacity rayon for automobile tires, hose, belting, and other rubber products.

Dresinate* 731...
One of Hercules many resin derivatives, Dresinate 731 is the emulsifying agent used to make GR-S-10.

Nitrocellulose...
Hercules nitrocellulose and ethyl cellulose provide lacquers of maximum adhesion, durability, gloss, and color.



Staybelite* Resins...
Odorless, non-staining softeners for natural rubber. Also used in synthetics, as described at left.

FOR FURTHER DETAILS

HERCULES POWDER COMPANY
INCORPORATED
918 *Market Street, Wilmington 99, Delaware*

Please send results of litharge-rosin rubber tests and technical details on Staybelite Resin and Resin 733.

*Name*_____

*Title*_____

*Company*_____

*Address*_____

*City*_____ *State*_____

CHECK THESE 2 PERFORMANCE PROVED CEMENTS AGAINST YOUR NEEDS!

N-100 SELF-CURING ADHESIVE ❋

for cementing together or one to another raw fabrics, coated fabrics, molded parts, leather, wood, paper, tubing, sponge, channel-stock, stripping and sheet material . . . *as a Sealant* for rubber and synthetic valve seats, gaskets, etc.

A Two-Part Neoprene Base Formula of Brush Viscosity and Neutral in Color

. . . Extremely high green strength . . . Good strength after standing 3 to 4 hours . . . Optimum cure reached in 10 days at 68-70° F (in 16 hours at 100-125° F; in 1 hour at 255-260° F) . . . Excellent water, oil, flame and delamination resistance . . . Chemical resistance to acetic acid, alcohols, aliphatic hydrocarbons, ammonia, calcium chloride, copper sulphate, fatty acids, hydrochloric acid, oxalic acid, phenol, sodium hydroxide, sulfuric acid . . . Extremely high shear strength . . . Contains no Benzol.

N-800 NEOPRENE PUTTY ❋

for Filling rubber, neoprene and other synthetic rubber parts . . . *for Repairing* wire cable . . . *as a Binder . . . and for Caulking.*

A Two-Part Neoprene Base Formula of Putty Consistency and Black in Color

. . . Bonds without Primers . . . Optimum cure reached in 10 days at 68-70° F (in 16 hours at 100-125° F; in 1 hour at 255-260° F) . . . High dielectric strength . . . Excellent water, oil and flame resistance . . . Chemical resistance to acetic acid, alcohols, aliphatic hydrocarbons, ammonia, calcium chloride, copper sulphate, fatty acids, hydrochloric acid, oxalic acid, phenol, sodium hydroxide, sulfuric acid.

❋ Both of these formulas have been *performance-proved* in important war production work over a period of several years.

Address all inquires to the Union Bay State Chemical Company, Rubber Chemicals Division, 50 Harvard St., Cambridge 42, Massachusetts.

UBS

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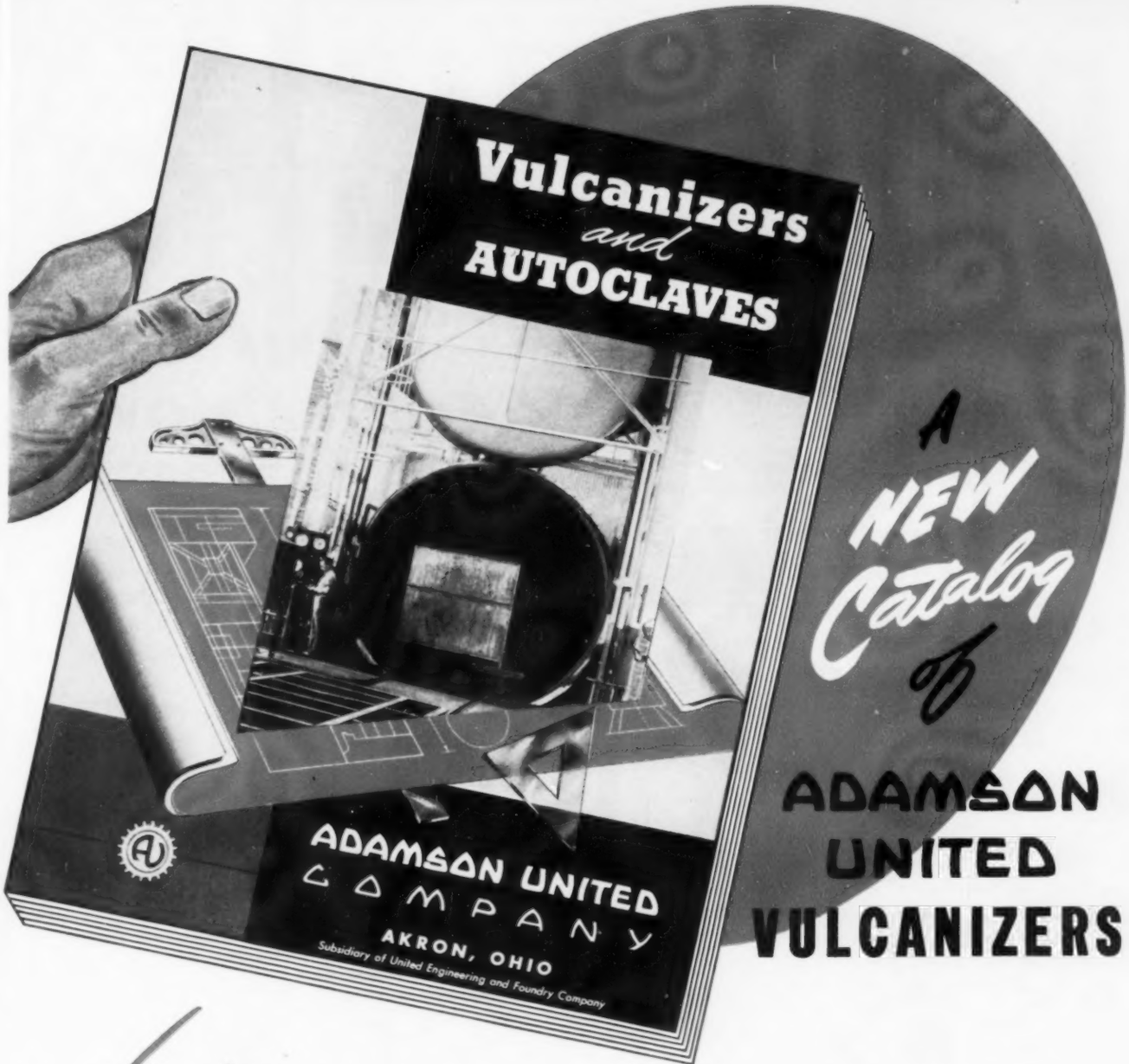

A NEW Catalog of

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It illustrates and describes the principal types of vulcanizers and autoclaves developed and manufactured by Adamson United and successfully used by leading rubber companies here and abroad. Its pages reveal the wide scope of Adamson United designs and the vast range of sizes of equipment available to the industry. Whether for present information or as a source of future reference, this new catalog will prove valuable for the information it contains and as an outline of Adamson United vulcanizing equipment installed and in commercial operation throughout the world.

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ADAMSON UNITED COMPANY engineers will gladly cooperate with you on all your technical problems and supply all possible data and information. Our abilities, experience and extensive manufacturing facilities are at the service of the industry.

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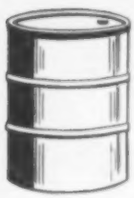
VETERANS OF WORLD WAR II:
To help you in purchasing surplus property from War Assets Corporation, a veterans' unit has been established in each of our Regional Offices*.

GOVERNMENT-OWNED SURPLUS NOW!



HYPOCHLORITE BLEACH—one year old material; manufactured with 30% available chlorine; grade 3; available as follows for 1½ cents per pound in carload lots; (F.O.B. location).

Birmingham — 305,600 lbs. in 400 lb. drums. Also one carload of grade 2, packed in 100 lb. drums.

Salt Lake City—8,785,572 lbs. in 43 and 50 lb. steel drums.

40% CHLORINATED PARAFFIN for fire proof, water proof and mildew proof coatings. Approximately 9 million pounds available for 2 cents per pound in car load lots or total amount at a single location, F.O.B. location as follows:

Boston, Cleveland, Detroit, Philadelphia, Richmond and Salt Lake City.

MIXED XYLIDINES; 7 cents per pound, carload lots, F.O.B. location.

POTASSIUM SULPHATE available for 10 cents per pound, F.O.B. location as follows:

Minneapolis: 93,075 lbs. in 400 lb. (app.) wooden barrels.
Chicago: 53,355 lbs. in 35 lb. fiber drums.

The chemicals shown here are surplus war material. They are available now at quick sale prices to meet civilian production needs. As with hundreds of other similar surplus chemicals they may be obtained by writing, wiring, or phoning your nearest War Assets Corporation office*. Make it *your* habit to check this source whenever your stock needs replenishing.

**In directories simply look up Reconstruction Finance Corporation. War Assets Corporation is an R.F.C. subsidiary.*

PAINTS

OIL TYPE, READY MIXED PAINT—SPEC. T-1215

Ready for use. This paint, containing linseed oil, may be brushed or sprayed to produce a flat finish which dries in a few hours. It is well suited to both interior and exterior walls wherever a medium grade low cost paint is permissible. It may be applied to wood, brick, masonry or concrete.

FOR INDUSTRIAL USES

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Light Green — Olive Drab
Dark Green — Loam
Field Drab — Earth Red
Earth Yellow — Haze Gray
Earth Brown — Black
Sand — White

For detailed information contact any of the War Assets Corporation Regional Offices below:

Price: 65 cents per gal., F.O.B. location; minimum sale, 200 gallons.

CHECK AND MAIL TODAY

To War Assets Corporation:

Without obligation, please send me further information on the following products and place my name on your regular mailing list:

- ☐ Glacial Acetic Acid, C.P. in one gal. bottles.
- ☐ Copper Napthenate, 8% solution in drums.
- ☐ Sodium Sulphite
- ☐ Manganous Chloride
- ☐ Smokeless Powder
- ☐ D.N.T. (Dinitrotoluol)
- ☐ Silica Gel; in various small size fabric bags weighing from 15 grams to 10 lbs. each.
- ☐ Khaki Dyes (basic colors)

Firm .....

Street .....

City .....State .....

155-2

A DISPOSAL AGENCY DESIGNATED BY THE SURPLUS PROPERTY ADMINISTRATION for Surplus Producers' and Capital Goods, Aircraft and Plants formerly handled by Reconstruction Finance Corporation . . . and for Surplus Consumer Goods formerly handled by United States Department of Commerce.

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155-2

INCREASE *Tensile and Tear* WITH WITCO HYDRO-CARBON MR

Witco (hydrocarbon) MR is a reinforcing plasticizer which actually increases tensile and tear up to 10-15 parts loading—even in compounds already loaded with 50 parts carbon black. Though most effective in GR-S it imparts its inherent resistance to age deterioration to natural rubber and reclaim stocks as well. In compounding GR-S and natural rubber reclaim, as much as 10-15 parts Witco (hydrocarbon) MR improves elongation and elasticity with original stress-strain properties maintained.

In addition to improving working qualities of any compound in which it is used Witco (hydrocarbon) MR strikingly improves flex-crack resistance (higher tear resistance, lower modulus) in GR-S. It is recommended for tire treads, camelback, footwear, molded and mechanical goods and extruded products.

Witco (hydrocarbon) MR in solid, crushed or granular form, is regularly supplied in two grades—#38 with lower melting point for GR-S, Black Diamond for other compounds. Special grades are also available. Send for a sample supply today.

GR-S TIRE TREAD STOCK

	Parts by Weight
GR-S (Buna S)	100.
Zinc Oxide	5.
Stearite	2.
Mercaptobenzothiazole	1.5
Sulfur	2.
Witco #12 Channel Black (easy processing type)	50.
Witco #38 MR	As shown

WITCO CHEMICAL COMPANY

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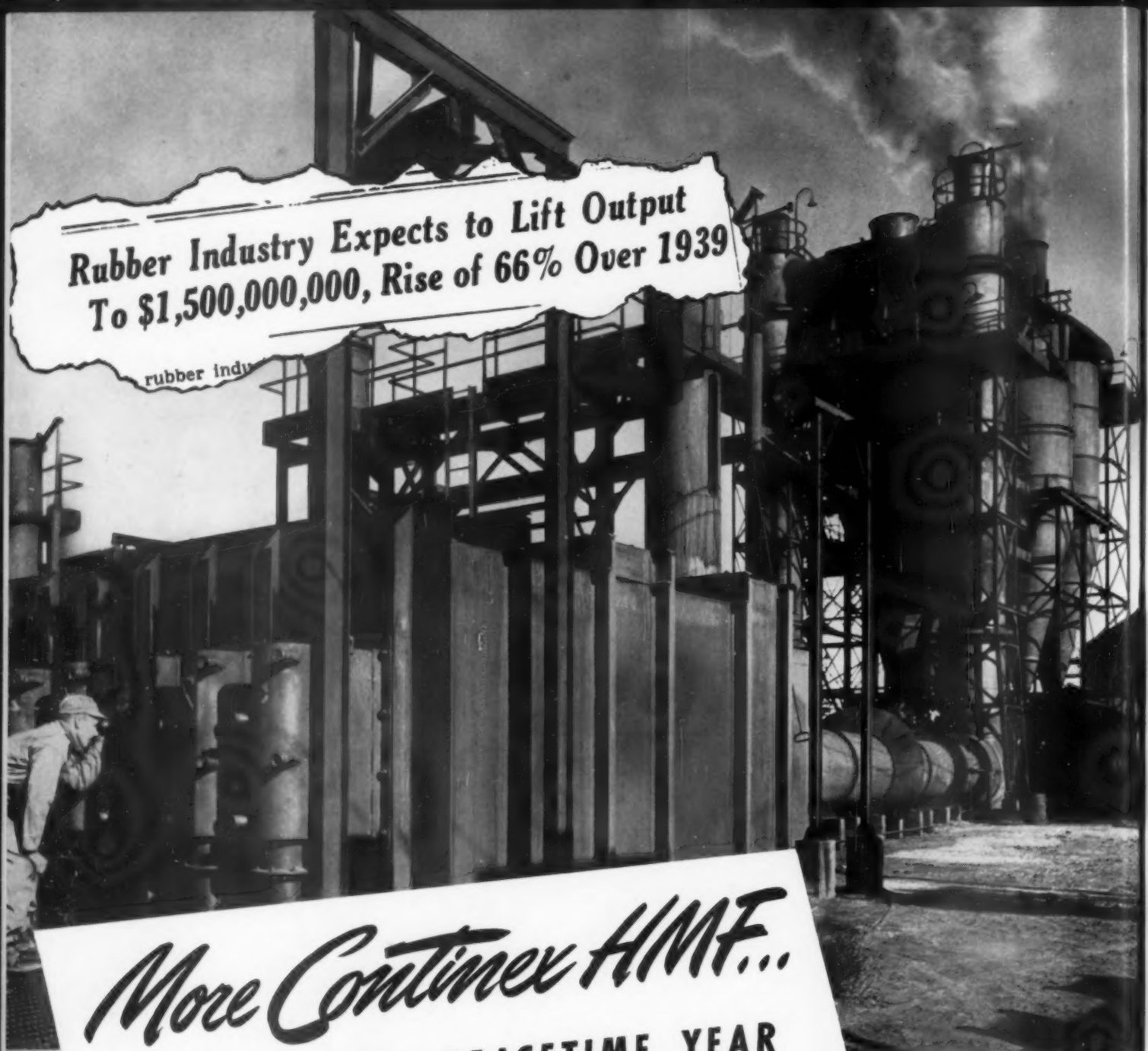

More Continex HMF...

FOR GREATEST PEACETIME YEAR

Section of Continental's new Sunray, Texas, plant producing Continex HMF.

Of the expected record high peacetime consumption of 900,000 tons of rubber in this country in 1946, 70% of production will be met by synthetics, chiefly GR-S, according to Civilian Production Administration estimates. In order to schedule production accurately and profitably the rubber industry must have an ample, dependable supply of HMF and other blacks. Continental's new Sunray, Texas, plant is now producing Continex HMF in ever-increasing quantities.

Every modern production and quality control measure necessary to maintain customary Witco-Continental quality standards is incorporated in the new plant. Experienced chemists, engineers and technicians guide every processing step from source gas to shipping container. Continex HMF is engineered to provide improved processing results in GR-S. Alone or in combination with channel blacks Continex HMF is exceptionally well suited for GR-S tire side walls, undertreads, mechanical rubber products or any other application requiring resistance to abrasive wear plus low hysteresis. Send for a sample supply today.

In addition to Continex HMF, Witco-Continental offers a comprehensive line of other quality blacks to meet general and specific rubber requirements.

CONTINENTAL CARBON COMPANY
MANUFACTURER

WITCO CHEMICAL COMPANY
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CONTINENTAL CHANNEL AND FURNACE BLACKS

295 MADISON AVENUE, NEW YORK 17, N. Y. • Boston • Chicago • Cleveland • Akron • Detroit • London

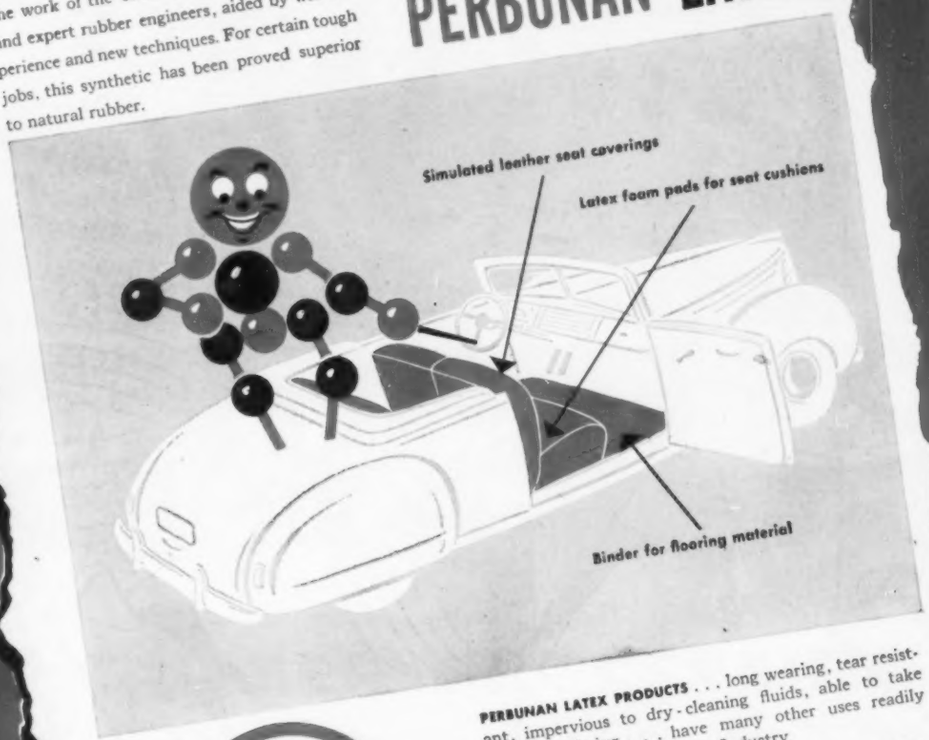
RUBBER MANUFACTURERS! Perbunan Latex is helping you sell to the Automotive Industry!

Here is one of a series of ads that we've pointed at the Automotive Industry. There'll be more . . . all helping you sell rubber products *made with Perbunan Latex.*

Here's a picture of a good combination

MODERN CAR AND PERBUNAN LATEX

It was for the Automotive Industry that this newest Perbunan polymer was developed . . . the work of the country's top research men, and expert rubber engineers, aided by war experience and new techniques. For certain tough jobs, this synthetic has been proved superior to natural rubber.



PERBUNAN LATEX PRODUCTS . . . long wearing, tear resistant, impervious to dry-cleaning fluids, able to take delicate coloring . . . have many other uses readily adaptable to the Automotive Industry

SPECIFY PERBUNAN LATEX . . . discuss it with your supplier of latex products. Call in our engineers to help with your tough rubber problems.

PERBUNAN

THE SYNTHETIC RUBBER THAT RESISTS OIL, COLD, HEAT AND TIME

STANCO DISTRIBUTORS, INC. 26 Broadway, New York 4, N. Y.; First Central Tower, 106 South Main Street, Akron 8, Ohio; 75 East Wacker Drive, Chicago 1, Illinois. West Coast Representatives —H. M. Royal Inc., 4814 Loma Vista Avenue, Los Angeles 11, California.

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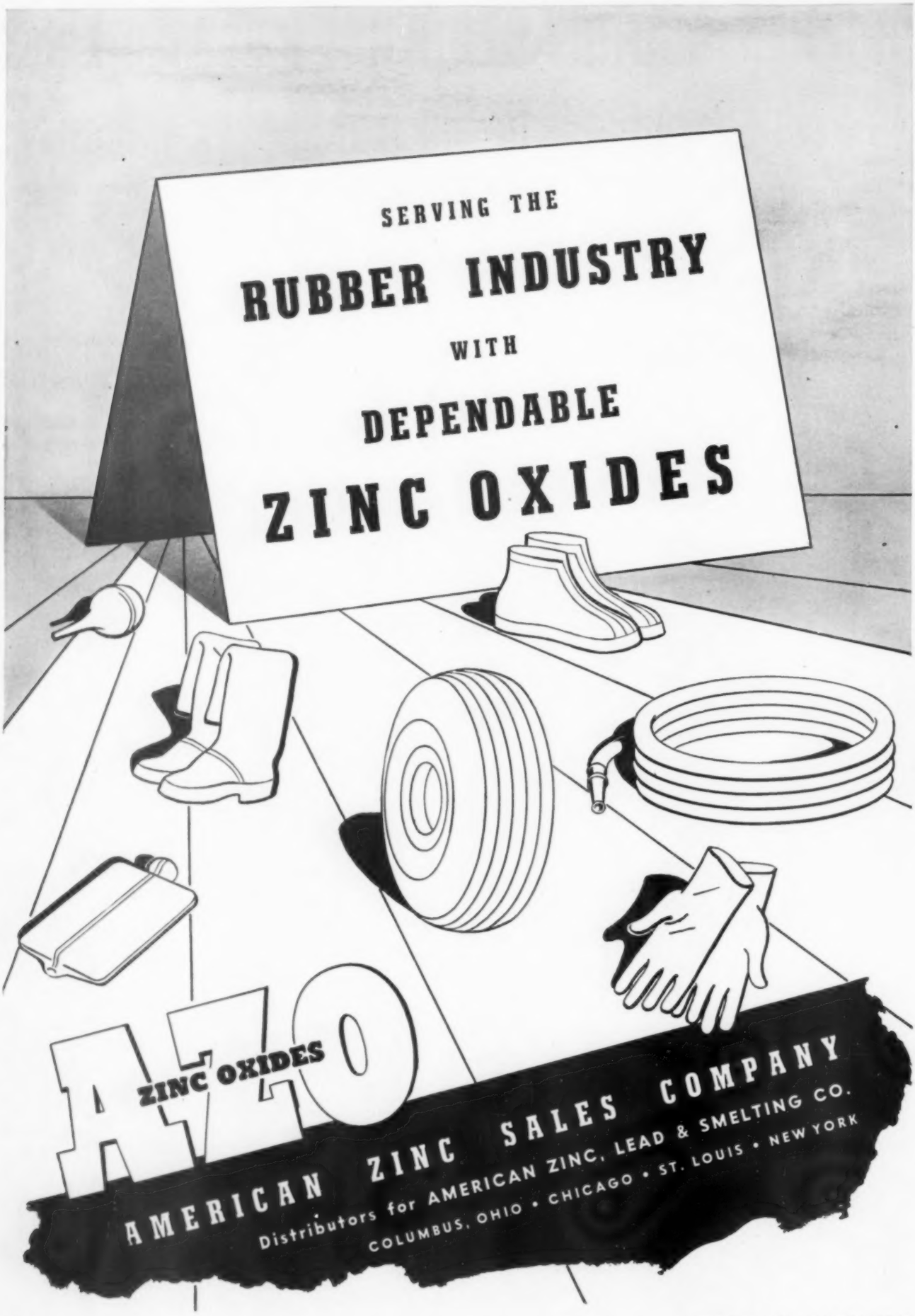
For the high quality rubber products demanded for the modern automobile, insist on Perbunan. It's been proved superior to natural rubber for many uses. Contact the nearest Stanco Distributors Office for help on any tough rubber compounding problem you may have.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CUTS MILLING-TIME 15%

SUN RUBBER-PROCESSING AID...

Used by Hose-Manufacturer for Faster Milling

A prominent manufacturer of special-duty hoses could not get the desired softness when milling Neoprene and pure gum rubber. He was using competitive processing oils as softeners. Shore Durometer hardness of under 25 was desirable, but not possible to obtain.

After consulting with a Sun Engineer, he switched to Sun's Circo Light Process Oil, and for two years has been able to obtain a Shore hardness of 20 and lower with the physical properties satisfactorily maintained. Milling-time has been cut by as much as 15%.

No blooming, or migrating, has been experienced, indicating the complete compatibility of Circo Light with the rubbers used.

For Neoprene, for natural rubber, for Buna-S, Hycar, or other synthetics, Sun technologists have developed remarkable processing aids that permit faster processing, better finished products. Call the Sun Engineer near you, and put the Sun experience and know-how to work in your plant today.

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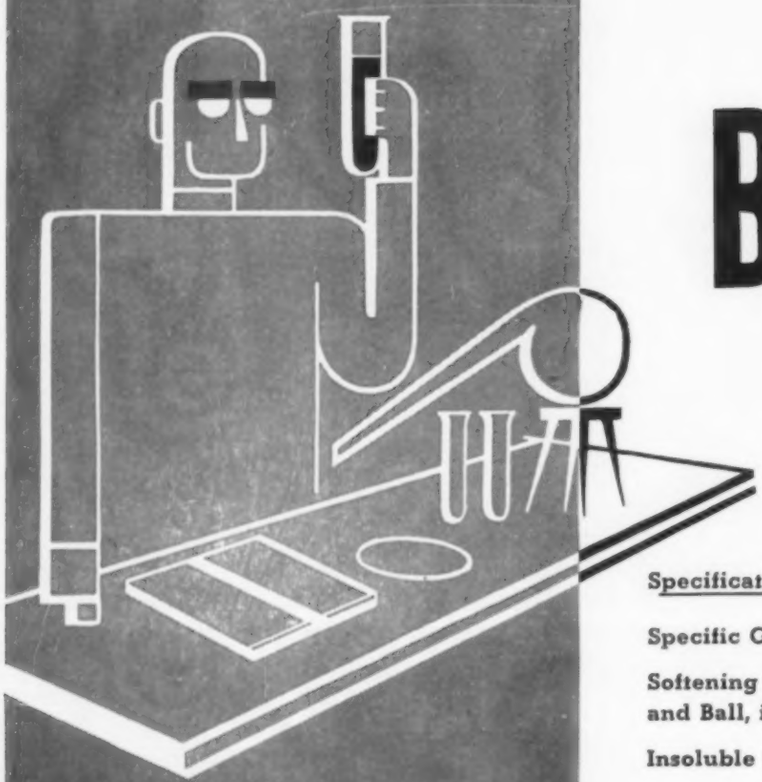
RUBBER COMPOUNDING MATERIALS...



B.R.C.*

NO. 20

B.R.C. No. 20 is a solid hydrocarbon derived from Coal Tar.

Specifications

Specific Gravity	1.25 to 1.32 @ 25°C/25°C
Softening Point, Ring and Ball, in Glycerine	175 to 185°F
Insoluble in Carbon Disulfide	15.0 to 25.0% by weight

B.R.C. No. 20 is an inexpensive solid type softener which can be used to advantage in the design of many compounds. It is a reinforcing plasticizer and tends to impart good processing characteristics, especially in highly loaded low-cost compounds.

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The C. P. Hall Co.
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ACCELERATORS

PLASTICIZERS

ANTIOXIDANTS

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The ultimate in GLAZED CLOTH

to meet all requirements for all types of rubber sheeting, must

have superior surface gloss

• • •

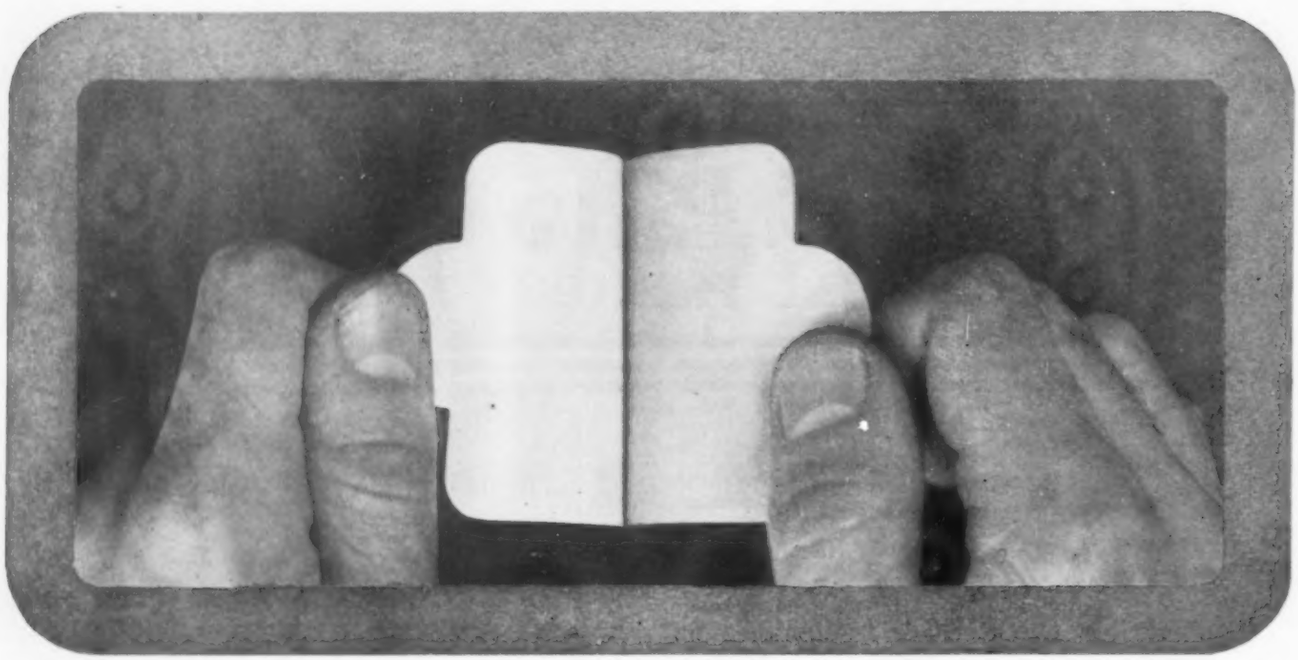
be of uniform caliper and tightly filled

• • •

carry minimum surface load

• • •

be non-flaking and pliable



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YOUR PROFITS?

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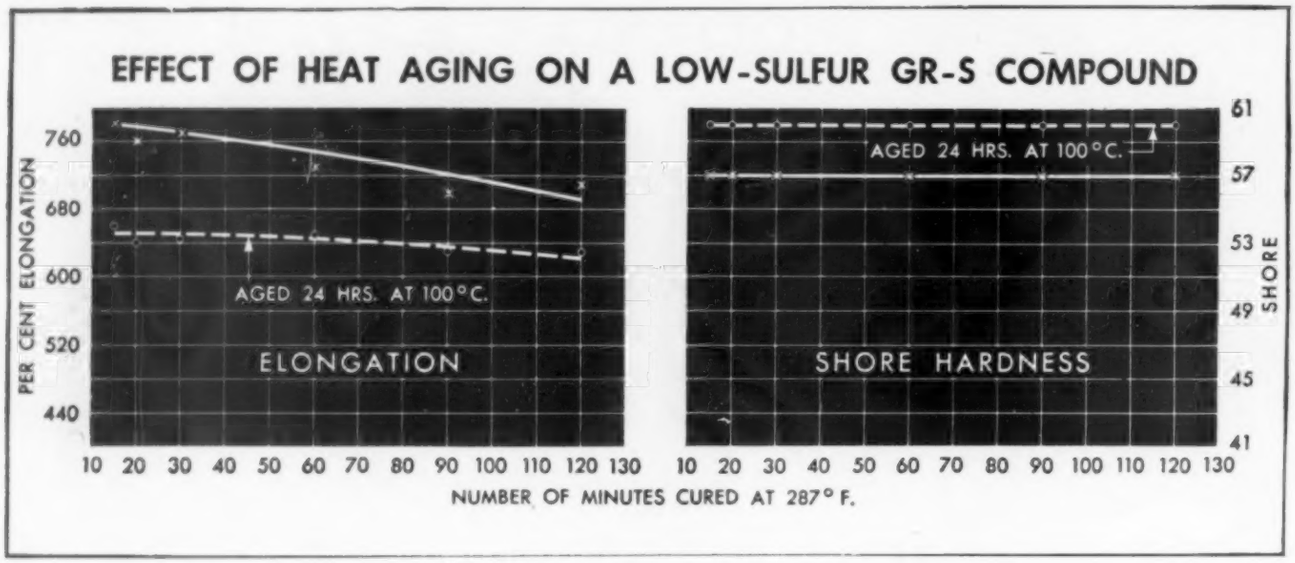

Physical Properties of GR-S Compounds Stay Put with New Low-Sulfur Formula

Heat resistance now made practical by

F.B.S LITHARGE

High retention of physical properties... how important is that to you?

Your GR-S can have it, merely by changing to a low sulfur formula.

Now such a compound can be cured in a practical time and without extra quantities of accelerator.

F.B.S. Litharge plus benzothiazyl disulfide is what produces safe, fast cures with low sulfur content.

The curing period can be varied from 15 to 120 minutes with scarcely any effect on elongation, hardness or modulus.

Moreover, the effect of aging on samples cured for various periods is almost uniform.

Reference to the accompanying tables and charts should be convincing.

• • •

Ask us to send you a printed report, "Compounding of GR-S for Heat Resistance," issued by the Rubber Division of our Research Laboratories, which covers the subject of F.B.S. Litharge for low sulfur formulas in greater detail and from a number of additional angles. Write to

FORMULA

GR-S (Institute)	100
E.P.C. Carbon Black	40
Sulfur	0.75
Zinc Oxide	3.0
Benzothiazyl Disulfide	1.0
F.B.S. Litharge	1.5
Coaltar softener	5

Data:

Time 287° F.	Tensile Strength	% Elong.	Modulus 300% Elong.	Shore Hardness
15	2890	780	640	57
20	3010	760	660	57
30	3090	770	660	57
60	2960	730	660	57
90	2850	700	685	57
120	2960	710	700	57
Aged 24 Hours at 100° C				
15	2970	660	980	60
20	3030	640	1020	60
30	2980	645	1000	60
60	3260	650	1040	60
90	3060	630	1130	60
120	2930	630	1040	60

OUTSTANDING CHARACTERISTICS:

The F.B.S. Litharge-thiazole combination used with low sulfur is characterized by the following:

1. Heat stability. • **2.** Fast curing rate • **3.** High flat modulus **4.** Excellent general physical properties • **5.** Processing safety **6.** Efficiency • **7.** Economy.

NATIONAL LEAD COMPANY

Rubber Division: 105 York Street, Brooklyn, N. Y.

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When you need something beyond mere materials, Whittaker can often help — for in serving a number of varied fields with *minerals, colors* and *pigments,* Whittaker has acquired a valuable perspective and fund of knowledge which it can bring to bear in its service to *each* field, individually.

Whittaker products are in standard use in the production of such varied commodities as cosmetics, leather, paper, paint, plastics, pharmaceuticals, soap and rubber goods—and Whittaker research is constantly revealing new possibilities in these and other fields. Often a new application of a mineral, color or pigment in an industry quite foreign to your own can suggest something of value that you can use. Whittaker has seen it happen. And many Whittaker customers have benefited by the experience Whittaker has so acquired. That's one reason so many — in so many fields — keep coming back.

If one or several of the Whittaker products interests you as a new possibility, write for technical data and laboratory samples, or for capable assistance and advice in your investigation. For established uses, you may place your order for commercial quantities with full assurance of getting materials of controlled high quality and uniformity.

204

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CLEVELAND — Palmer Supplies Co.
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A Strategic Middle Route that unites the East with the Mid-West, Intermountain and all Pacific Coast states.

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General agency offices are located in metropolitan cities, coast to coast, with a staff of experienced traffic men trained to assist you and other shippers in effectively meeting your transportation problems.

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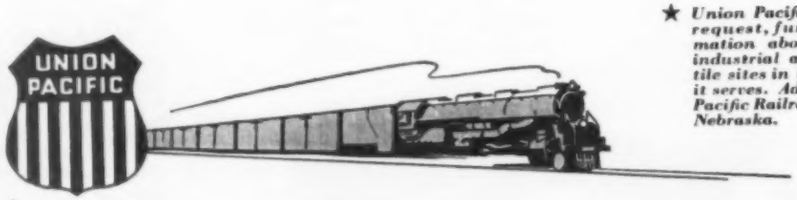
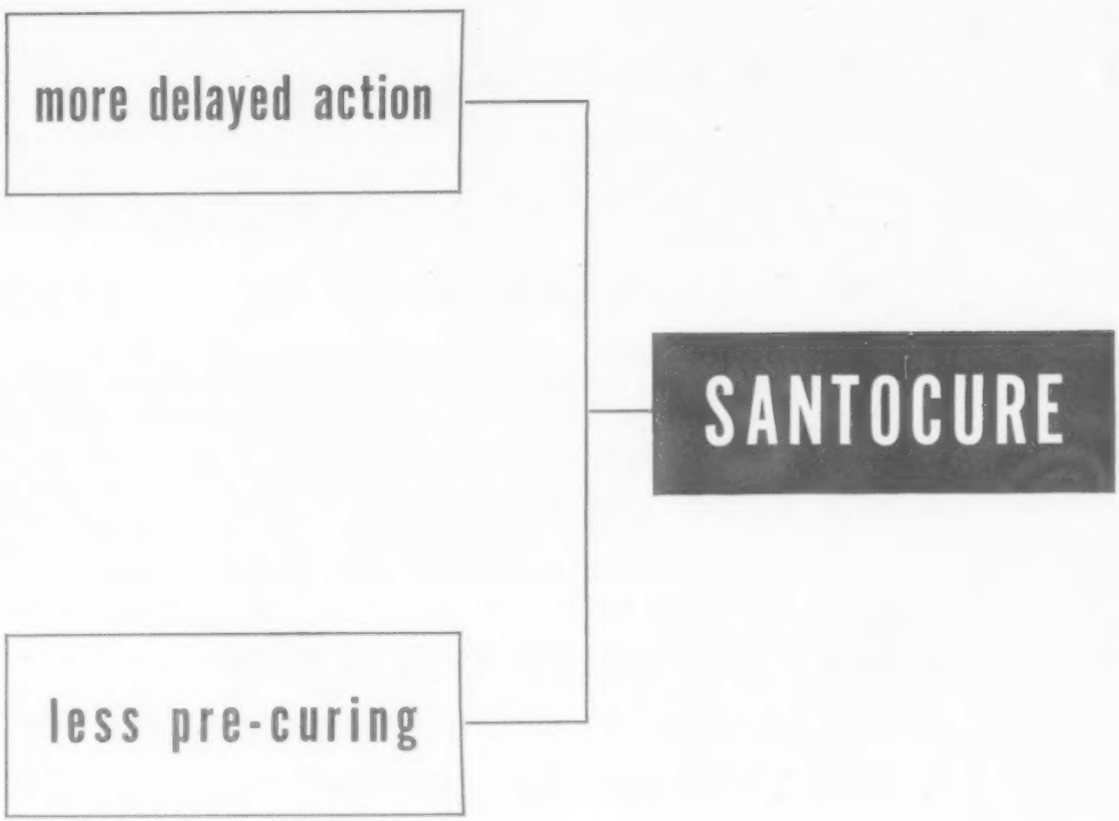
★ *Union Pacific will, upon request, furnish information about available industrial and mercantile sites in the territory it serves. Address Union Pacific Railroad, Omaha, Nebraska.*



The Progressive

UNION PACIFIC RAILROAD

The Strategic Middle Route



When used alone, Santocure* — Monsanto's Accelerator for Rubber Vulcanization — is quite inert at low temperatures and exhibits more delayed action and less precuring than any other commercial organic accelerator. Under the influence of time and temperature, it breaks down into its components to form a remarkably fast and strong accelerator.

While Santocure will give best results if used alone—when consistent with available curing time and temperature — activation with D.P.G. is excellent for general purposes.

Information and details on the application of Santocure to your specific problems are available. Contact MONSANTO CHEMICAL COMPANY, Rubber Service Department, Second National Building, Akron, Ohio.

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Accelerators	Plasticizers
Antioxidants	Insoluble Sulfur "60"
Colors	Wetting Agents

MONSANTO CHEMICALS
SERVING INDUSTRY...WHICH SERVES MANKIND

FOR
LATEX COMPOUNDING

- **NO. 1954 EMULSION**

  A combination emulsion and tackifier which when used with Latex (synthetic or natural) produces latex cements with excellent tack retention and improved tensile strength.

- **NO. 1956 EMULSION**

  A three way emulsion for Neoprene latex. Acts as an acid acceptor in addition to being a tackifier and Neoprene extender. An exceptional compounding base for Neoprene latex cements.

- **NO. 1737 DISPERSION**

  A combination curing dispersion and acid acceptor for Neoprene latex.

- **NO. 1740 FILLER DISPERSION**

  A combination filler and stabilizer for all types of latex.

- **NO. 1754 QUICK DRYING DISPERSION**

  Speeds up drying of latex compounds.

- **NO. 1760 DISPERSION**

  For compounding latex to adhere to non-porous surfaces such as plastic.

- **NO. 1917 A. P. FOAM REDUCER**

  Prevents latex compounds from foaming when used in machines.

★ *We also manufacture over 400 types of Rubber Cement and Latex Cement*

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(ESTABLISHED 1895)

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And whiter, brighter
Coated Lithwite cartons make
more eyes reach for your
product in today's mass counter
and shelf displays

LOOK FOR RISING OPERATING COSTS to force more and *more* retailers into self service. And look to *Coated* Lithwite Cartons to give *your* product a real advantage in mass displays where *eye* value means *buy* value. For the smooth, velvety surface of Coated Lithwite brings colors up brilliantly . . . reproduces pictures with eye-catching realism. Chalk-free. Rub-resistant. It gives packages a quality look and feel that helps win many a point-of-sale decision.

Made by a revolutionary new process, *Coated* Lithwite is the amazing paperboard that is formed, made and coated in one high-speed operation. Proved and improved for seven years. Used today, for packaging many of America's most famous products.

Fewer "Jammers" and "Leakers." *Coated* Lithwite folds without shattering or flaking. Takes a tight, positive seal. At present, *Coated* Lithwite production is completely sold up. But now's the time to investigate *Coated* Lithwite, talk over future carton needs with a Gardner-Richardson representative.

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The GARDNER-RICHARDSON Co. • Manufacturers of Folding Cartons and Boxboard • Middletown, Ohio

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GOVERNMENT-OWNED CHANNEL TYPE CARBON BLACK PLANTS

FOR SALE OR LEASE

The War Assets Corporation, a subsidiary of RFC, has been designated as a disposal agency by the Surplus Property Administration and invites proposals for the purchase or lease of the following properties in the interest of continued employment. These properties were acquired by various agencies of the government for production in the war effort, and are now, or shortly will be, declared surplus to government needs. Listing of these plants by name of lessee is for identification purposes only, and has no connection with the lessees' own plants or facilities.

Machinery and Equipment in each of the channel type carbon black plants described below consists of special machinery for the manufacture of Channel Type Carbon Black including burners, scrapers, conveyors, pulverizers, loading and bagging equipment, machine shop and laboratory equipment.

Guymon, Oklahoma (Plancor 2317)
Cabot Carbon Co. (Texas County)

Complete Channel Type Carbon Black Plant, capacity: 15,000,000 lbs. of Channel Type Carbon Black per year.

LAND consists of approximately 59¼ acres—plant site, 56 acres; housing site, 3¼ acres. Leased: Easement for water and power line—right of ingress and egress for construction, repair and maintenance.

BUILDINGS AND FACILITIES include 192 Burner Buildings, construction concrete, steel and sheet iron, total, 310,504 sq. ft. Approximately 12 other buildings including Process Buildings, Shop Buildings, Warehouse and Service Buildings, construction generally concrete, steel or wood frame, sheet iron or asbestos siding. 20 frame dwellings for workmen. Total all buildings approx. 342,767 sq. ft.

Water from Lessee's plant. Gas wells on site. Sewage disposal plant on site. Other utilities. Chicago & Rock Island R.R. Parallel to site U.S. Oklahoma Highway No. 54. **War Assets Corporation (RFC), OKLAHOMA CITY, OKLAHOMA.**

●

Seagraves, Texas (Plancor 2316)
Columbian Carbon Company (Gaines County)

Complete Channel Type Carbon Black Plant, capacity: 13,000,000 lbs. of Channel Type Carbon Black per year. Gas Desulphurization Plant; 20" Gas Supply Pipe Line and 3 miles of railroad siding and switch track.

LAND (owned) consists of approximately 235¾ acres as follows: (a) 25¼ acres for railroad right of way, (b) 26½ acres for housing sites at Carbon Black and Treater Plants, (c) 17½ acres for Treater Plant site, (d) 160 acres for Carbon Black Plant site, (e) 6⅓ acres for access road. Leased land: Approximately 49-4/5 acres for 33′ right of way for 20″ Gas Pipe Line 65,158′ in length.

BUILDINGS AND FACILITIES including 160 Burner Buildings construction concrete foundation, steel frame and sheet steel sides and roofing. Total approx. 250,560 sq. ft. 17 other structures including Refining Buildings, Warehouse Buildings, Machine Shop Building, Pump Houses, Administration Building, etc. Construction generally structural steel frame, sides and roof of corrugated cement asbestos, concrete and wood floors and concrete foundations. 19 frame dwellings for workmen. Total all buildings approx. 288,462 sq. ft.

Water from wells on site. Gas from West Texas Gas Company. Other utilities. Santa Fe R.R. siding. State Highway No. 51. **War Assets Corporation (RFC), DALLAS, TEXAS.**

Sunray, Texas (Plancor 2277)
Continental Carbon Company (Altman County)

Complete Channel Type Carbon Black Plant, capacity: 20,000,000 lbs. of Channel Type Carbon Black per year. 16″ Gas Supply Pipe Line.

LAND (owned) consists of approximately 155 acres as follows: Carbon Black Plant site 149-2/5 acres; Housing site 5½ acres. Leased land: 50′ right of way for 16″ Gas Pipe Line 11,747′ in length.

BUILDINGS AND FACILITIES include 228 Burner Buildings, construction concrete foundations, steel frame, black sheet iron sides and roofs, total approx. 437,760 sq ft. 8 other buildings including Processing Buildings, Storage and Supply Warehouse, Machine Shops, Administration Building, Change House, etc. Construction generally concrete foundations and floors, steel frame, corrugated asbestos walls and roofs. 20 frame dwellings for workmen. Total all buildings approx. 475,777 sq. ft.

Water from wells on site. Gas from Shamrock Refining Company. Sewage disposal plant on site. Other utilities. Rock Island R.R. sidings. Convenient to arterial highways. **War Assets Corporation (RFC), DALLAS, TEXAS.**

●

Monument, New Mexico (Plancor 2254)
Chas. Eneu Johnson (Dona Ana County)

Complete Channel Type Carbon Black Plant, capacity: 15,200,000 lbs. Channel Type Carbon Black per year. Desulphurization Unit, and 14″ Gas Pipe Line.

LAND consists of approximately 616-3/5 acres including plant site and Gas Pipe Line right of way approximately 2,839 rods long and 2 rods wide.

BUILDINGS AND FACILITIES consist of 144 Burner Houses, construction steel and concrete with metal roofs, total approx. 259,584 sq. ft. 10 other smaller Process and Service Buildings, approx. 23,108 sq. ft. 14 frame dwellings for workmen. Total all buildings approx. 291,428 sq. ft.

Water from wells on site. Gas from Warren Petroleum Company Refinery. Sewage disposal plant on site. Other utilities. Texas and New Mexico R.R. siding. Plant site adjacent to State Highway No. 18, 8 miles south of Hobbs, New Mexico. **War Assets Corporation (RFC), DALLAS, TEXAS.**

●

Eunice, New Mexico (Plancor 2253)
Panhandle Carbon Co. (Lea County)

Complete Channel Type Carbon Black Plant, capacity: 15,000,000 lbs. of Channel Type Carbon Black per year. Gas Treater Plant. 20″ Gas Supply Pipe Line.

LAND (owned) consists of approximately 148½ acres as follows: Carbon Black Plant site, 130⅓ acres; Treater Plant site 3⅓ acres; Housing sites at Carbon Black Plant and Treater Plant 5¼ acres; Access Road 8-4/5 acres. Leased land: 50′ right of way for 20″ Gas Pipe Line 40,715 ft. long.

BUILDINGS AND FACILITIES consist of 168 Burner Buildings, construction concrete foundations, steel frame, black sheet iron sides and roofing, total 322,560 sq. ft. 9 other structures including Process Building, Warehouse, Machine Shops, Boiler House, Electrical Sub Station, Administration Building, Laboratory, etc. Construction generally concrete, steel frame, corrugated asbestos walls and roofs. 18 frame dwellings for workmen. Total all buildings approx. 357,948 sq. ft.

Water from wells on site. Gas from Phillips Petroleum Company. Sewage disposal plant on site. Other utilities. Texas and New Mexico Railroad sidings. State Highway No. 8. **War Assets Corporation (RFC), DALLAS, TEXAS.**

●

Odessa, Texas (Plancor 2279)
United Carbon Co., Inc. (Ector County)

2 complete Channel Type Carbon Black Plants, capacity: 41,000,000 lbs. of Channel Type Carbon Black per year. 3 Gas Treater Plants; 4 Gas Pipe Lines 14″, 26″ and 24″, 26″ and 16″ in diameter.

LAND (owned) consists of approximately 425¾ acres as follows: Carbon Black Plant 394-4/5 acres; Water Supply site 3-1/5 acres; Treater Plant at Judkins 2/5 acre; Housing site at Judkins 1 acre; Treater Plant at Barnsdall 2-1/5 acres; Housing site at Barnsdall 1½ acres; Treater Plant at Goldsmith 3-3/5 acres; Housing site at Goldsmith, 1 acre; Treater Plant at North Cowden 2 acres; Housing site at North Cowden 1½ acres; Housing site at Odessa 14½ acres.

Leased land for right of way of pipe lines as follows: Carbon Black Plant to Judkins—50′ wide, 32,120′ long; Carbon Black Plant to North Cowden—50′ wide, 84,089′ long; from North Cowden to Barnsdall—50′ wide, 27,341′ long; Carbon Black Plant to Goldsmith 50′ wide, 86,255½′ long.

BUILDINGS AND FACILITIES consist of Plant No. 1: 176 Burner Buildings, structural steel frame with sheet iron covering, total 310,080 sq. ft.; Plant No.2: 240 Burner Buildings, structural steel frame with sheet iron covering 426,240 sq. ft. Other structures including various Process Buildings, Machine Shops, Administration Buildings, Warehouses, etc., in respective locations. Construction generally structural steel with corrugated metal or corrugated asbestos sidings. 88 frame dwellings for workmen situated on 5 different sites. Total all buildings approx. 852,800 sq. ft.

Water from wells on sites. Gas from Phillips Petroleum Company, Cities Service Petroleum Company and Barnsdall Petroleum Company. Sewage disposal system. Other utilities. Texas and Pacific R. R. siding. U. S. Highway No. 80. **War Assets Corporation (RFC), DALLAS, TEXAS.**

CREDIT TERMS MAY BE ARRANGED FOR THE PURCHASE OF THESE PLANTS

General information is available from your nearest War Assets Corporation (RFC) Office. For specific data, contact the office indicated for each plant. All data contained herein are necessarily abbreviated and subject to correction. They are not intended for use as a basis for negotiations. WAR ASSETS CORPORATION reserves the unqualified right to reject any or all proposals or offers received for the above properties.

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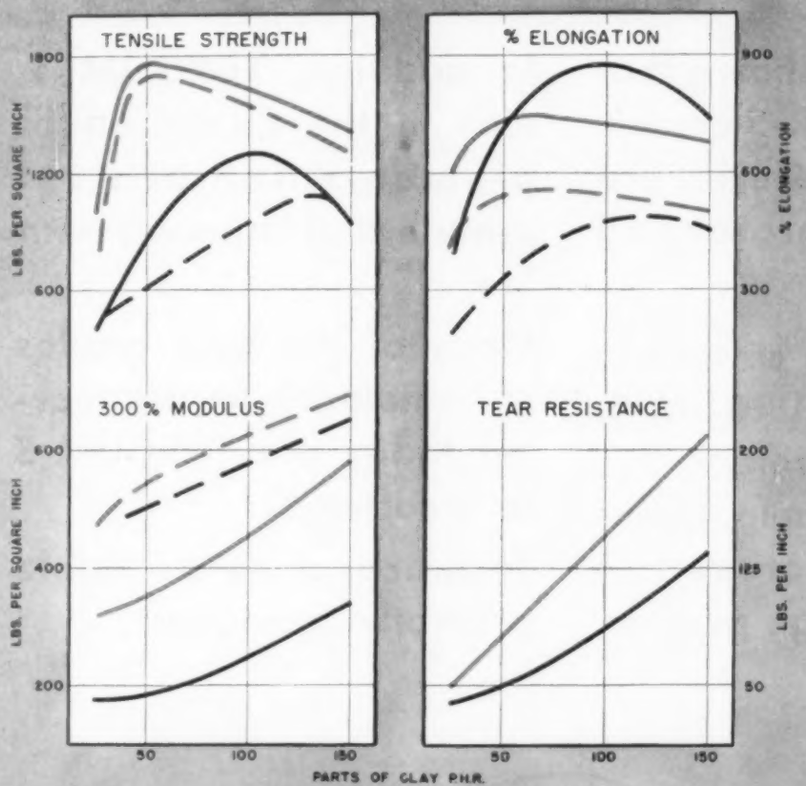
362-T

SHARPLES VULTAC . . .

THE NEW VULCANIZING AGENT WHICH GREATLY IMPROVES THE PHYSICAL PROPERTIES OF GR-S STOCKS REINFORCED WITH HARD CLAY

Standard GR-S with as low as 25 to 50 parts loading of Hard Clay can be vulcanized with VULTAC to give improved results with respect to stress-strain, tear resistance and flex-crack growth resistance. These enhanced properties are largely retained after severe air-oven aging.



FORMULA

GR-S	100
Stearic Acid	2
Zinc Oxide	5
Hard Clay	varied
Santocure	2
DOTG	0.25

VULCANIZING AGENT

VULTAC No. 2	11.0	—
Sulfur	—	2.5

Optimum cures at 280° F. selected from "Modulus — time of cure" curves.
for VULTAC 15 min. @ 280° F.
for Sulfur 20 min. @ 280° F.

	VULTAC	Sulfur
Original	———	———
Aged 72 Hours at 212° F. in Air Oven	- - - -	- - - -

VULTAC is a faster curing vulcanizing agent than sulfur in GR-S stocks reinforced with Hard Clay. The greatly improved physical properties realized with VULTAC over a wide range of clay loadings indicate that it is an effective dispersing agent for this mineral filler.

Additional data and suggestions for the use of VULTACS in GR-S stocks reinforced with Hard Clay or other mineral fillers will be sent gladly upon receipt of your request.

SHARPLES CHEMICALS Inc. PHILADELPHIA • CHICAGO • NEW YORK

TURGUM S
PRESERVES CAMELBACK

Experience has shown that ordinary raw GR-S camelback stocks deteriorate sharply with prolonged storage.

Resin-acid type softeners, as typified by TURGUM S, will definitely retard this tendency and help maintain physical properties over long storage periods.

In addition, TURGUM S, aids in the dispersion of pigments, inhibits cut growth, and improves heat life.

Many of the best grades of camelback on the market today use TURGUM S as a softener.

Technical data available promptly on request.

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J. M. HUBER, Inc.

460 West 34th Street

NEW YORK CITY

The RUBBER AGE

VOLUME 58

NUMBER 6

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CONTENTS FOR MARCH, 1946

Geon in the Wire and Cable Industry—*By Geo. A. Fowles* 703

Photographic Reproductions Now Possible on Almost All Surfaces 708

Some Aspects of Reclaiming GR-S—*By H. Harmon Gillman* 709

Division of Rubber Chemistry to Meet in Atlantic City on April 10, 11 and 12 715

Goodyear's Tire Machine 724

REGULAR DEPARTMENTS

New Equipment Section	744	Coming Events	730
Book Reviews	752	Obituaries	742
Editorial	726	Los Angeles News	740
Financial News	738	Rubber, Cotton Markets	760
Names in the News	736	Chemical Markets	762
Canadian News	743	Classified Ads	764

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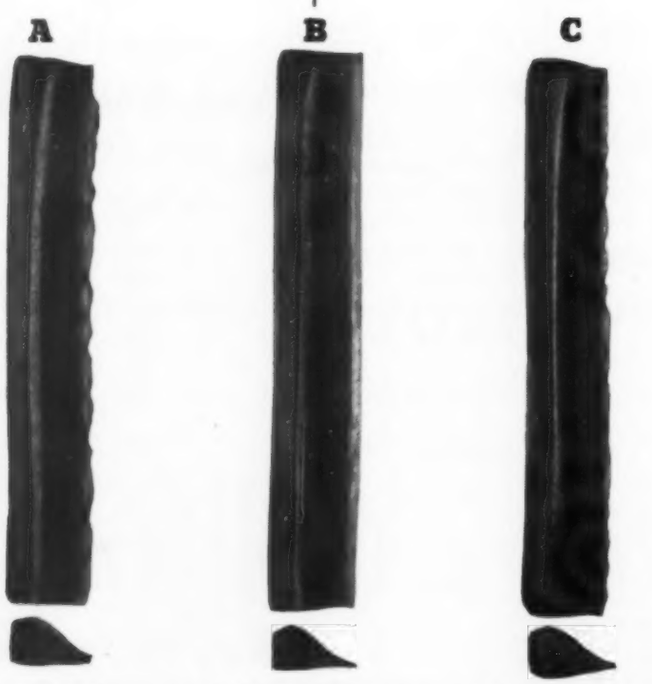
1. Gives better processing
2. Gives better extrudability after prolonged storage.
3. Gives better aging properties

LAUREX vs. stearic acid in **GR-M**



- **PROCESS**
- **ACCELERATE**
- **PROTECT . . . with**

NAUGATUCK CHEMICALS

Bulletin No. 93 gives full details of this test. Write for your copy.

NAUGATUCK CHEMICAL

Division of United States Rubber Company

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RUBBER AGE

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Geon in the Wire and Cable Industry

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THERMOPLASTICS and synthetic rubbers have almost completely replaced natural rubber within the last five years as a jacketing and insulating material on wire and cable. This has come about in spite of the fact that natural rubber had been used continuously and quite successfully in this application for a half century.

Taking the spotlight among the thermoplastics are the vinyl resins. Although developed only in recent years, they are today among the materials most widely used in the insulating and jacketing of wire and cable. They have reached this eminent position, not only because of their properties, but also because of their ease of processing. Their processing on plastic extruders, which eliminates both the vulcanization process, with its attendant difficulties, and the milling process, proved a life-saver in keeping up with the war's tremendous electrical needs.

The war, with its shortage of natural rubber and consequent emergency needs, caused the vinyl resins to be tried in many applications for which they might not otherwise have been considered. In many such instances, they have proved superior and now, occupying a strong position because of their outstanding characteristics, will doubtless be continued in such uses. Consequently, usage of these resins, which had reached substantial proportions before Pearl Harbor was widely expanded during the war.

During the war years, nearly all the purchases of the vinyls by the wire and cable industry were earmarked for the armed services to be made into insulation and protective jackets on wire and cable, with the Navy taking the larger share. The impetus given to vinyl resin production by war needs is indicated in its annual production figures, showing 18,000,000 pounds total production in 1940, 83,000,000 pounds in 1943, 114,000,000 pounds in 1944, and an estimated 125,000,000 pounds in 1945.

To Dr. Waldo Semon of the B. F. Goodrich Company must go credit for one of the first of the many applications of vinyl resins. Approximately 15 years ago, Dr. Semon, in seeking a good tank lining material, found that he was able to make a rubber-like material by combining certain high boiling point organic liquids or plasticizers with polyvinyl chloride.

Especially Suited for Insulation

The polymers of polyvinyl chloride are especially suited for wire and cable insulation because of their ability to combine with plasticizers to form elastic materials, dimensionally stable over reasonable operating temperatures, readily extruded at temperatures of 300 to 400° F. and having most of the other properties required for such use. Many types of plasticizers, with widely variable properties, can be used, making it possible to formulate compounds to meet the varying needs of the wire designer and user.

Best known among the many commercial vinyl resins now available are the following:

Polymers	*Copolymers*
Vinyl acetate	Vinyl acetate and vinyl chloride
Vinyl alcohol	Vinyl chloride and vinylidene chloride
Vinyl butyral	
Vinyl chloride	
Vinyl formal	
Vinylidene chloride	

Of these vinyl resins, the ones most widely used by the wire and cable industry are the polymers and copolymers of vinyl chloride.

In the manufacture of the vinyl resins, the first step is the combining of hydrogen chloride and acetylene. The result of this action is vinyl chloride, which, in its monomeric form, is an inflammable gas under normal conditions of pressure and temperature and a liquid at or below —13.8° C. The vinyl chloride is then converted to polyvinyl chloride in large polymerizers under the influence of heat, catalysts and modifying agents. The polyvinyl chloride is a fine powder, almost white and having a specific gravity of approximately 1.4. The various other vinyl polymers and copolymers are produced in similar fashion, using, of course, the proper base chemicals.

For all wire and cable uses, the polyvinyl resins are plasticized and may contain from 10% to 40% plasticizer depending on the hardness or softness of the materials desired in the end product. Special properties may be obtained by adding pigments such as carbon black, whiting, clay and others. The formulations for insulation applications are usually brilliantly colored to match required NEMA standards.

In almost all of the formulations used, a stabilizer is added to retard the chemical breakdown and to improve the electrical properties of the resultant compound. One of the early problems involved in the use of these polymers was to stabilize them so that they would not break down chemically under high temperature processing. After several years of intensive study, the polyvinyl chloride polymers, now produced, exhibit by far the lowest rate of gas evolution of any of the elastomeric polyvinyl materials. These polymers evolve gas when subjected to 150° C. at the rate of only 0.01% by weight per hour. At temperatures lower than 150° C. the rate of gas evolution is so very slow that it is impractical to make measurements.

Potential Plasticizers Are Varied

There is a wide variety of potential plasticizers which may be used. Our own laboratories have already investigated over 1,000 and are finding more daily. Of the hundreds tried, there are actually relatively few that are practical in combination with polyvinyl resins where many desirable properties are required in a single compound. Probably the most common plasticizers are tricresyl phosphate and dioctyl phthalate. In many cases it is desirable to use several different plasticizers to obtain the necessary combination of properties desired in a single compound. In most types of wire insulation, low temperature flexibility may be desired in combination with flameproofness. To obtain these characteristics, tricresyl phosphate is commonly combined with other types of plasticizers such as dioctyl phthalate. As in previous rubber compounding, each plasticizer has its own individual effect, and the compounder must investigate many combinations to arrive at the desired result.

At the present time most of these plasticized resins are supplied in the form of tape, batch sheet, or granules, which are fed into extruders and thus formed as a covering on wire. They may also be supplied in the form of tape to be wrapped directly on the wire. Such tape insulated wires may be later heated to obtain a completely sealed covering, and are usually covered with an outer protection, such as cotton, glass or metal braids.

Description of Extrusion Machine

A typical semi-production plastic extrusion machine used in applying Geon plastic to copper wire is shown in Fig. 1. This particular extruder is designed for No. 14 gage wire or smaller. The picture with the description of the process that follows, will show how easily and simply wire is insulated with polyvinyl plastic. The wire is fed into the die (2) of the extruder from reel (1). Being fed into the die simultaneously from the extruder chamber (4) is the plastic material. Wire leaves the die (2) coated to the proper thickness with the hot plastic. From here it submerges into the circulating water of reservoir (5), where it is cooled after a circuitous path over a series of reels, the tops of two of which can be seen (6). It is then placed on reels for test or use.

The crux of the process lies in the extruder chamber (4) where the granular polyvinyl plastic must be gradually heated to a soft plastic state and fed at a closely controlled rate into the die. The granular material is fed into the feed box (3), which may be kept cool, by circulating water as shown in this installation. From here the granules automatically feed themselves into the cylinder of the extruder where it is slowly conveyed to the die by worm action under gradually increasing temperature. At the point of entry into the die, it has reached a temperature of 375° F. The cylinder is heated by a surrounding jacket of steam, baffled into sections with an increasing gradient of temperature in each. In some installations, oil is used as the medium for heating instead of steam. The die block is heated electrically to the same temperature as the plastic, namely 375° F.

Extruded or taped plasticized vinyl resins, as applied to wire, usually have physical properties within the following range:

Tensile Strength	1500 to 3000 psi.
Elongation	150 to 400 per cent
Modulus at 100% Elongation	500 to 1500 psi.
Tear resistance	15 to 40 lbs.
Specific gravity	1.2 to 1.5
Low temperature flexing limits	0° C. to —60° C.
High temperature operating limits	60° C. to 80° C.
Flame resistance	Slow burning to self-extinguishing
Color	NEMA standards
Chemical resistance	Inert to action of acids, alkalies and ordinary solvents.
Oil resistance	Excellent (minute quantities of plasticizer extracted by volatile oils).
Weather resistance	Excellent resistance to the action of sun, ozone and ordinary weather conditions.

All of these desirable qualities cannot be given any

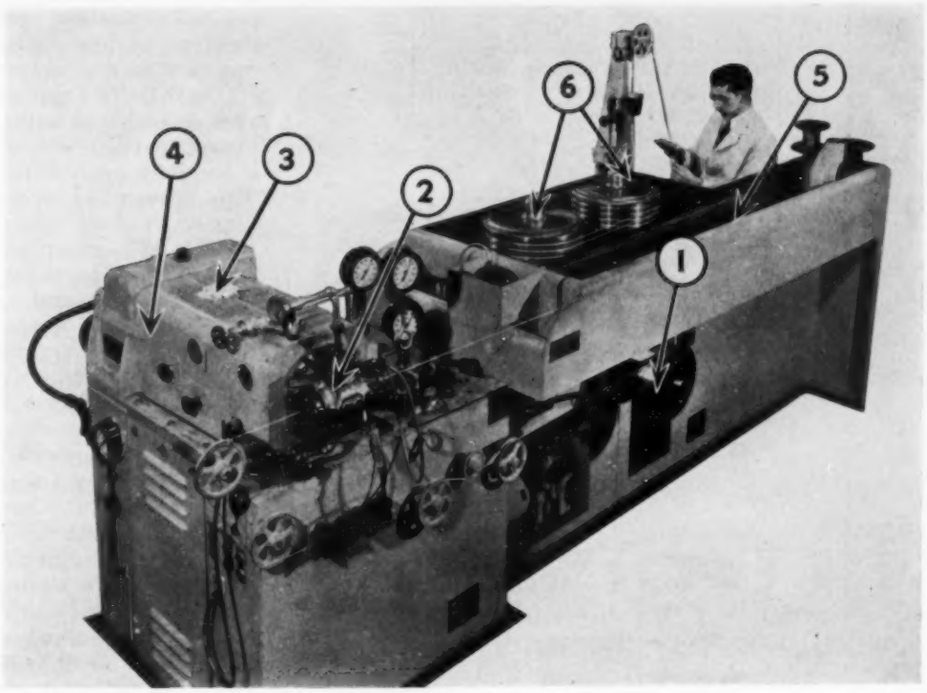

FIG. 1 — Semi-production plastic extrusion machine. (See text for full description).

one compound. As is true of rubber compounding and other chemical formulations, plastic compounds for wire use are compromises designed to cover the range needed for a particular application or group of applications. The ranges shown in the foregoing table are those for commercial formulations. For special purposes they may be further modified to obtain emphasis of a special characteristic.

The compounding problems of the plastic formulator are broadly classified for the wire and cable industry as listed below.

1. Because of the limited requirements of the single insulated conductors, two or three formulations normally suffice to take care of most insulation requirements.

2. In the case of jackets and their more severe requirements, it has been necessary to design many more compounds, *i.e.,* for low temperature portable cable service softer materials containing special plasticizers must be supplied so that the heavy wall thicknesses required in the jackets will flex without cracking. Unfortunately the plasticizers for use with resins on low temperature cables are somewhat more volatile at high temperatures and are not as flameproof as those usually used on high temperature cables. In order to obtain flameproofness and to cut down the plasticizer loss at high temperatures, most of the compounds designed for low temperatures are complex compromises.

3. Special attention must also be given to the problem of designing compounds for high temperature service. At the present time certain of the polyvinyl chloride plastics are approved for continuous operating service at temperatures of 80° C. without a protective covering. Much higher intermittent temperatures are possible, but not recommended for continuous service. The intermittent temperature limits may be based upon the point at which excessive softening or deformation occurs and also the point at which excessive deterioration of the polymer becomes evident. Most of the compounds on simple insulated wires will not deform under moderate weight by more than 45% at 121° C. over a period of one hour. The electrical and chemical stability are probably less affected by these temperatures than is the physical ability to resist deformation. Therefore, the physical deformation is probably the best criterion of maximum intermittent operating temperatures for the simple insulated wire. This is not necessarily true of the more complicated types of cables where asbestos or glass are used as physical protection and in combination as a part of the insulation.

Probably the most outstanding superiority of the vinyl chloride plastics over natural rubber lies in its excellent aging characteristic. For example, because of the resistance of the vinyls to ordinary aging, the standard aging tests such as the Geer oven and oxygen bomb tests are no longer significant except as a measure of the volatility of the plasticizer and the resultant hardening of the insulating compound. However, this extraction of the plasticizer occurs so slowly that tests, run normally on ordinary rubber compounds for 7 to 14 days, require a run of 60 days at 70° C. to detect appreciable effects on the vinyl chloride plastics. Even after 60 days at 70° C. the tensile strength may be absolutely unaffected and the elongation may be reduced by only a few per cent. It is therefore evident that ordinary aging means little to these vinyl resins and that ordinary wire insulated with them will have a very long life.

These vinyl chloride plastics are remarkably resistant to lubricating oils and the ordinary solvents but will be softened somewhat by certain lacquer solvents, the aliphatic and aromatic ketones, the acetic anhydrides, the aromatic amino compounds and some other organic compounds containing chlorine, bromine or nitro groups.

Contrariwise, they will harden as a result of plasticizer volatilization in very high temperature air or

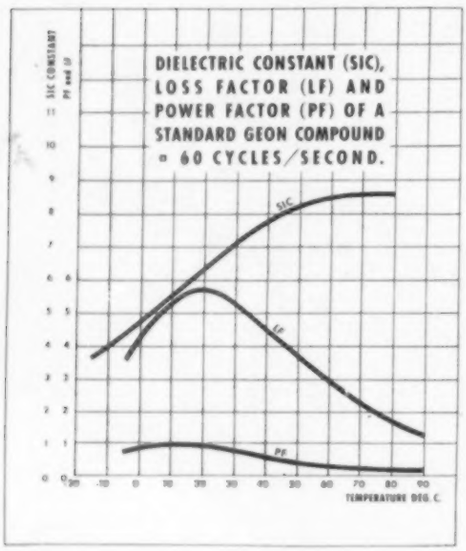
DIELECTRIC CONSTANT (SIC), LOSS FACTOR (LF) AND POWER FACTOR (PF) OF A STANDARD GEON COMPOUND @ 60 CYCLES/SECOND.
SIC
LF
PF
TEMPERATURE DEG. C

FIG. 2—Effect of temperature on the electrical properties of the thermoplastic vinyl polymers.

very high temperature water and other liquids where a leaching action may occur. In either case the effect on the physical and electrical properties is not nearly as severe as that found with the use of natural rubber.

It should always be remembered, in installing wire insulated with thermoplastics that *they are thermoplastics* and must be used within their temperature limits.

Because another physical property of the vinyl chlorides, resins and plastics has proven so superior to natural rubber, the Navy, during the war, took the lion's share of the polyvinyl resin insulated wire produced. Further, most of the wire going on all naval craft was insulated with polyvinyl resin. That property, its flameproofness, has been such an improvement over the standards established for natural rubber that the Navy has designed more severe flame tests than those previously used by the industry. The value of this flameproofness to the home wiring field can be appreciated when it is learned from the Fire Underwriters that the second largest cause for home fires is that due to electric wiring faults.

Flameproofness, in the case of these vinyl chlorides, is an ability to prevent the propagation of flame or to be self-extinguishing. Some of those designed for exceptionally low temperature work at —70° C. are not self-extinguishing, but are better classed as "slow burning" as are some of the others designed for types of service other than for wire and cable use; but it is safe to say that most of these materials sold for wire and cable use do not propagate flame or are self-extinguishing. This property of flameproofness has also made it possible to design electrically heated fabrics such as used in aviator suits, blankets, coverings for delicate airplane instruments and many others. These were previously considered too dangerous for use if rubber insulated wire was incorporated in their design.

In addition to its exceptional physical properties, the polyvinyl resins possess an outstanding dielectric strength, which ranges from 400 to nearly 2000 volts per mil depending upon the wall thickness tested and the type of test applied. A good average figure for ordinary wall thicknesses and average tests might be 700 to 800 volts per mil. A dielectric strength of such values combined with excellent physical qualities has proven particularly useful on wire and cable where it has been possible to use thinner walls of insulation. This in turn has been a means for saving weight, cutting down space requirements and generally making it possible to carry up to twice as much power in a given size of conduit, an important factor in these days of increased motor and lighting loads.

The effect of temperature on the electrical properties of the thermoplastic vinyl polymers can be seen in Fig. 2 which shows power factor, dielectric constant and loss factor plotted against temperature. The particular curves shown are for a standard insulating compound of polyvinyl chloride. As seen from the curves, the power factor, dielectric constant and loss factor are low at a temperature of —5° C., increasing with temperature rise. The power factor and loss factor reach their peaks between 10 and 20° C., decreasing above this temperature to arrive at reasonable values between 70 and 90° C., while the dielectric constant increases steadily up to 80° C.

The decreasing phase of the power factor and loss factor characteristic makes it possible to use this type of insulation for heavy currents at ordinary voltages where the cable charging current is not the important factor that it may be for very high voltage cables. The latter operating at 70° C. would carry exceptionally large charging currents because of the relatively high dielectric constant. This factor has thus far prevented the use of the polyvinyl chlorides as insulation on high voltage power cables but has not prevented its use on 5000 volt airport lighting cables where the charging current may be tolerated because of the relatively short time use of the cables.

The insulation resistance of these materials has been increased in the last few years by research developments from a low value of a few megohms per 1000 feet at 60° F. to values, now obtained commer-

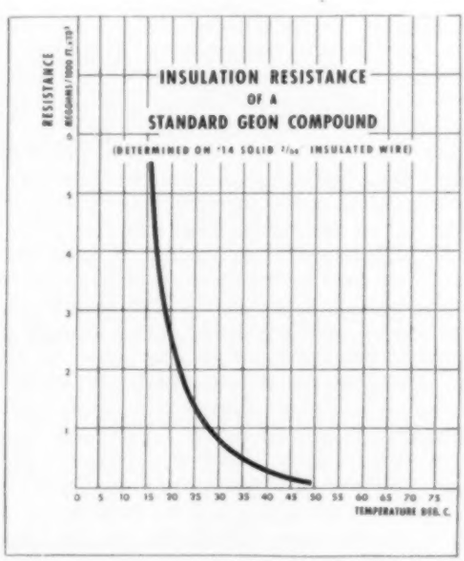

FIG. 3—Insulation resistance of a standard Geon compound.

cially, of 5,000 to 10,000 megohms per 1000 feet on No. 14 solid wire with 2/64 inches of insulation. The latter values are comparable to those of the better grades of natural rubber insulation. It should be pointed out, however, that the insulation resistance of these thermoplastics is affected by temperature changes, gradually decreasing in value with rise in temperature. This resistance-temperature change follows the pattern shown in Fig. 3.

It should be mentioned at this point that long immersion in water seems to make negligible changes in the insulation resistance of these materials, even after 60 days in water at 60° C. The change in dielectric constant and loss factor at 25° C. in water amounts to an increase of 10 to 15% after 20 days immersion. The decrease in dielectric strength over the same period is approximately 10%.

In view of the performance of the chemists in the past several years in their development of the polyvinyl resins and plastics, it is safe to predict that there will be continued rapid progress in the further development of thermoplastic materials. Besides the basic changes in the thermoplastics, and those due to improvements in plasticizers, stabilizers and compounding ingredients, we can expect many new types of materials to be introduced on the market for insulation.

As a matter of fact, the B. F. Goodrich Chemical Company has, in the last year, introduced two new types which are presently being used in large scale experimental work. The first of these is a blend of polyvinyl chloride and the acrylonitrile types of synthetic rubber which blend is a thermosetting material and possesses the desirable characteristics both of the thermoplastic and the thermosetting types of insulation. At the present time these vulcanizable blends seem to offer the best properties which may be obtained as jackets on portable types of wire and cable. They do not have quite as good insulating properties as GR-S or the polyvinyl resins themselves but they do possess unusual physical properties. However, the thermosetting properties of the blends permit their use at higher temperatures than are practicable with thermoplastics. The second new material introduced in the last year is a polyvinyl resin latex. This latex,

FIG. 4—Some applications of Geon in the electrical field.

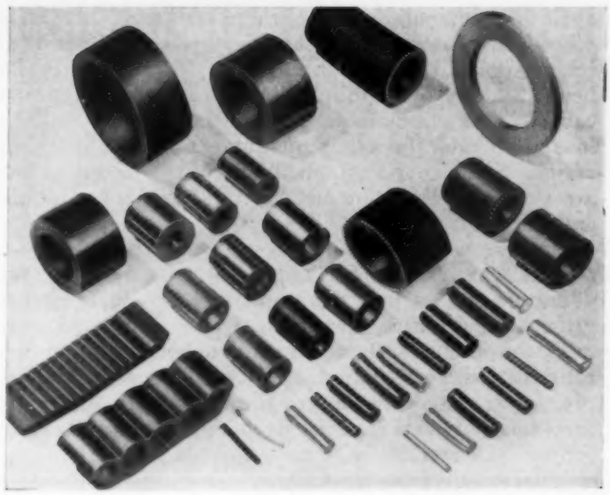

FIG. 5—Some tubular extrusions of Geon vinyl polymers.

possessing all of the properties of the thermoplastics, may be applied to wire on the conventional tower used for applying rubber latex.

Both of these materials, announced in the last year, represent a revolution in the thinking of the wire and cable manufacturer. We may expect many more changes of this character in the field of plastic polymers, where the surface only has been scratched.

Before getting too far into the field of conjecture, it may be well to go back and discuss some of the uses of wire insulated with polyvinyl resin. From the previous statements, it may be imagined that the insulating and jacket uses of the polyvinyl resins would cover almost the entire wire and cable field, with the exception of the high voltage power cables and low-loss communication cables. Even on the latter, the resins are used as jackets. It is almost easier to point out the exceptions to their use than it is to name the uses. To be more specific, however, a general classification of uses is given in the following table.

USES FOR WIRE AND CABLE INSULATED OR JACKETED WITH POLYVINYL RESINS

Equipment Wiring (Stationary and Portable)

Aircraft or Automotive: Low tension wire, power, control and communication. (Also used in tubings and as protective coverings on conduits and fabrics).

Marine: Low voltage power and control wiring, instruments, switchboards, etc. Telephone wire for cable, switchboards, cords, etc. Radio hook-up wire and jackets for high-frequency cables. (Tubing and tapes are used for protective purposes also). Underwater power, signal and control systems.

Miscellaneous: Motor and control leads, portable cords and cables, internal wiring. Lamp cords, household appliances, radio-hookup, etc.

Building, Industrial and Permanent Installations

Communication: Insulation on short runs such as indoor telephone wire, cords, drop wire, switchboards, jackets on cables both low and high-frequency.

Construction: General building wire such as type T (formerly SN), non-metallic sheathed cables, bell wire, cords, etc.

Industrial: General wiring of electrical equipment, machine tools, signal systems, low voltage power and control wiring, mine and oil well cables, etc.

Utilities: Jacketing for power and lighting cables, insulation for airport lighting, general control, switchboard use and secondary circuits. Service entrance, parkway and portable cables.

Besides the above uses, there are probably many others that come to the reader's mind. In thinking of other applications, the limitations should be remembered and an open mind kept towards new types of cable construction made possible by thinner walls of insulation and the other advantages of the polyvinyl resins. Some current applications in the electrical field are shown in Fig. 4, while Fig. 5 shows some tubular extrusions of Geon.

If there were ever any question as to the future of the polyvinyl resins for wire and cable use, the war definitely settled that once and for all. In the emergencies of wartime operation, the pressure was great to discontinue the use of natural rubber and many new constructions were tried. The result was that these resins were used in many applications where otherwise they might never have been considered. In most instances they proved themselves so well that they will undoubtedly continue in use.

The wire and cable manufacturers have purchased over 225 plastics extruders, which they will undoubtedly continue to use. Many new companies were formed to extrude plastic insulated wire to meet the demands of the war uses. The question of its future can be answered finally and positively by the radio manufacturers, automotive producers, contractors and construction men, who prefer it because of the simplicity of this type of insulated wire and for the outstanding job which it is capable of doing.

To summarize, its flame-proofness, light weight, high dielectric strength and its resistance to oil, acid and aging are so superior to natural rubber that in the great majority of cases, we feel that the industry will find a large place for the polyvinyl resins and plastics.

Photographic Reproductions Now Possible on Almost All Surfaces

A NEW process by which metal, wood, cloth, leather, plastics or almost any other surface can be made usable for photographic reproduction has been developed by the Glenn L. Martin Co., Baltimore 3, Maryland. Basis of the new process is said to be an emulsion which can be spread on many kinds of materials, sensitizing them for photographic print use.

The new process was developed by Martin laboratory chemists shortly before the war and during the conflict it speeded aircraft production by permitting engineers to work in full scale. Drawings were projected rapidly and in number directly on metal, wood and plastic surfaces. These were then used for reference, fill-in, tooling (tools could be built directly on the templates), inspection tools and for cutting out pieces for experimental aircraft directly from the drawings projected on the rigid surfaces. Savings thus effected in aircraft engineering and production were enormous and the system was used widely throughout the aircraft industry.

After printing, the metal, wood or plastic prints are developed in the same manner as any commercial photo paper. Either line drawings or continuous tone negatives can be printed, by projection or contact. Through use of the emulsion, it is possible to print photo murals directly on walls. Photographic book plates can be printed on the covers of treasured volumes, or names printed on personal articles such as wallets and key rings. Signs of various sizes are easy to make photographically.

In its normal state, according to Martin chemists, the emulsion is a thin jelly-like substance which, when heated to a temperature of 125 degrees, becomes a liquid which may be applied to the desired surface with a camel's hair brush, a soft sponge or a soft rag. Allowed to dry, the negative is then printed on the sensitized surface and development proceeds normally as if it were a commercial paper. All operations are carried out under dark-room conditions, using ruby lights. The emulsion may be heated any number of times without affecting its efficiency or printing qualities.

In industry, the process will have its uses in the reproduction of drawings for manufactured products or machinery. Such drawings can be either to full scale for ease in reading and checking during manufacturing process, or can be reduced if portable prints are desired. Proportions remain, of course, exact and the need for redrawing to a different size, with possibility of error, is eliminated. The same negative can print to any size desired.

While the pictures possible under the new process are now restricted to black and white prints, these can be hand tinted with transparent oils in the same manner as are many portraits now, giving the effectiveness and loveliness of color.

The development of a new **bellows type low range pressure gauge** suitable for indicating draft pressures or any low pressures of gases or liquids that are not corrosive to bronze has been announced by Manning, Maxwell & Moore, Bridgeport, Conn. The pressure element is a self-draining bronze bellows with a phosphor bronze calibration spring which makes an extremely sensitive and accurate gauge.

North American Philips Co., Inc., 100 East 42nd St., New York 17, N. Y., has developed an **X-ray scanner** for use with its Searchray 150 X-ray units. The new scanner is said to overcome distortion and displacement which is present in all conventional methods of X-ray image recording.

Eastern Engineering Co., New Haven, Conn., has developed a new **heat dissipating unit** for use in television, radar, high pressure mercury lamps, x-ray tubes, induction heating units, etc. The unit is furnished complete with thermostat control, thermostatic valves, and flow switch.

A new pulsing control drive, called the **Yardeny Pulsing Drive,** which provides single knob precision control of any type of reversible motor, is a new product of the Yardeny Engineering Co., 105 Chambers St., New York 7, N. Y. By depressing the knob and turning it slightly right or left, continuous forward or reverse rotation of the motor can be accomplished.

Some Aspects of Reclaiming GR-S

By H. HARMON GILLMAN

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THIS paper presents an analysis of the problem of reclaiming GR-S. Every reclaimer is aware of the problem once he attempts to apply to GR-S his present methods of reclaiming rubber. He generally obtains a dry, hard material which is almost impossible to knit together on the refiner. Official recognition that the problem exists was given by the organization of a Technical Advisory Committee of the Rubber Reclaimers Association—formed at the request of W.P.B. —to exchange information in regard to reclaiming synthetics. In addition, a number of papers and recent publications have pointed out the nature of the problems facing the reclaiming industry *(1, 6, 21, 37, 38)*.

In attempting to trace the important factors in regard to reclaiming of GR-S this paper first reviews present knowledge concerning the known differences between rubber and GR-S; it then proceeds to mention briefly our understanding of vulcanization and of the reclaiming mechanisms for rubber; finally, it endeavors to demonstrate which of the characteristics of GR-S interfere in attempting to reclaim it by present methods and which will need to be overcome before a successful solution to the problem of reclaiming GR-S will be found.

Reclaim plays an important part in our national economy. To the rubber industry it represents a significant source of raw material *(47)*. It has been predicted that our supply of natural rubber tire scrap will diminish rapidly so that in two years a preponderance of reclaim will necessarily be GR-S *(37)*. The urgency of solving this problem is apparent.

Rubber has found its wide usage, not due to any single property, but due to a unique combination of properties. It has: high strength and high elongation; long range elasticity over a wide range of temperature; toughness and resistance to wear; non-permeability to water, air and gases; high resistance to cutting and tearing; pliability (or the capacity to withstand both a single bend as well as repeated flexing); ability to be modified in physical form from very soft to very hard —from solid to porous, the diverse qualities of electrical conductance as well as electrical insulation; it can easily be processed and fabricated.

Reclaim has found industrial utilization because it possesses properties similar to rubber to a more or less degree. Reclaim has been defined as the product resulting from the processing of vulcanized scrap rubber *(34)* which can be compounded, manufactured, and vulcanized after the manner of crude rubber *(35)*.

Reclaim, rather than crude, has been used as a source of hydrocarbon due in some part to the following considerations *(33, 9)*. In the first place, for many products it is much more economical; secondly, it is easier to process, requiring lower power consumption, mixes quicker, holds its dimensions on calendering and extrusion better, runs cooler, knits well and has good flow properties; thirdly, it has a faster rate of cure which may be utilized to give quick mold turnover; finally, it is uniform—a tailor-made product that may be designed for any of a number of uses.

Note: This paper was awarded third prize in the contest sponsored by the Chicago Rubber Group under the title "On the Utilization of Cured Synthetic Rubber Scrap." A condensed version of the paper was delivered by the author before the group at a meeting held in Chicago, Ill., on January 25, 1946.

Natural Rubber versus GR-S

What may be said about the "rubbery" state? Resilient polymers are characterized by the properties of strength, stretchiness and elasticity. These properties in turn are not principally influenced by the kind of chemical elements in a polymer, but by their arrangement, size of molecules, and structure brought about by vulcanization. Elastomers, therefore, do not signify any particular hydrocarbon material, but a class of substances all similar physically to natural rubber *(40)*. This definition suggests a whole family of materials, the most important member at present being GR-S.

GR-S was chosen for mass production on the basis of its general characteristics and relative facility for economical production from domestic raw materials *(6)*. It resembles rubber in that it has similar properties. A point which we will develop later is that the problem of reclaiming GR-S has arisen due to the manner in which it differs from rubber in composition, in structure, and in behavior.

What is known of the differences between rubber and GR-S? The characteristics of Hevea rubber, itself, will first be considered. Natural rubber is a hydrocarbon whose outstanding property is long range elasticity. It is unsaturated, of high molecular weight, roughly 200 to 4400 isoprene units *(4)*, and its molecules are long, flexible chains *(25)*. A two-phase structure, sol and gel, has been suggested which consists respectively of relatively low and high molecular weight fractions, soluble and insoluble in petroleum ether. Vulcanization with sulfur causes marked alterations in its physical properties, a change of state from plastic to elastic, loss of solubility and tack, and extension of the useful temperature range.

GR-S differs from rubber in that: it is composed of butadiene and styrene units; its molecular weight distribution curve is transposed *(42)*; it may not be crystallized either by freezing or stretching as it is amorphous under all conditions *(41)*; the temperature range in which it exhibits rubber-like properties is shorter and is shifted to a higher temperature *(40)*; it has lower elasticity and rebound, higher hysteresis, and lower extensibility; it has only 90% of the unsaturation of natural rubber *(5)*, which means that it cures somewhat slower and has lower combined sulfur; the vulcanization reaction is more difficult to initiate, and a more delicate balance of sulfur and accelerator is needed, although the shape of the stress-strain curves is similar *(30)*; its sulfur linkages in GR-S gum stocks

do not differ very much chemically from those present in pale crepe gum stocks *(43)*.

Further, GR-S resists oxidation better as shown by being relatively unaffected *(56)* under conditions which oxidize rubber to volatile products *(2)*; it has a higher deterioration temperature *(36)*; it is more resistant to chemical attack as shown by the greater difficulty in preparing its derivatives such as the cyclized, chlorinated, and hydrochloride reaction products *(10)*; it does not flex crack in the same manner as rubber *(4)*, which has been attributed to the failure of GR-S to relax *(49)*; the size of the original latex particle is smaller *(42)*; it can tolerate a copper or manganese concentration 20 to 40 times as great as rubber; GR-S copper containing stocks show stiffening as against resinification and reversion for rubber *(31)*. GR-S is similar to rubber in electrical properties such as dielectric constant, power factor and resistivity *(42)*. Their oil and solvent resistance lie in the same range.

The above description summarizes most of the essential dissimilarities. Examining in somewhat more detail it is found that as compared to rubber GR-S has low tensile strength in gum stocks. Kemp *(19)* has explained this as being due to a failure to obtain effective cross linkage during vulcanization with sulfur, caused in turn by non-symmetry of the chain structure. Where vinyl and benzene side groups are located in the GR-S side chain, the separation of adjacent molecules will be considerably greater than in natural rubber chains with shorter methyl side chains. Less effective cross-links thereby result causing weak areas in the vulcanizate structure.

Continuing, it is found that the physical properties of GR-S compounds deteriorate faster than natural rubber with a rise of temperature *(19)*. This behavior can be explained on the basis that the physical properties of GR-S depend to a great extent on van der Waals' association forces and less on chemical cross-linking than do those of similar natural rubber vulcanizates. These association forces between the polymer chains, as well as between the reinforcing pigment particles and GR-S chains, are greatly reduced at elevated temperature. Thus, a weaker gel structure results in cured GR-S than in the more effectively and highly cross-linked Hevea gel. Gelation resulting from branch chaining and cross-linking is present in GR-S in varying degrees depending on conditions of polymerization and subsequent processing.

In regard to processing, Sebrell *(42)* has shown that rubber is plasticized to a greater extent by milling than GR-S. The Williams plasticity value between one and ten mill passes shows a drop of 75% for rubber, whereas under the same conditions GR-S shows a drop of only 10%. Similarly, he shows that milling tremendously increases the extrusion rate of rubber, whereas GR-S shows only minor improvement.

The nerve, or recovery after processing, has been associated with the phenomenon of gel formation, the amount of gel ordinarily being reduced by mechanical working *(42)*. Neal and Ottenhoff *(32)*, however, show some anomalous behavior of GR-S on milling. Contrary to expectation, as the mill temperature is increased the nerviness also increases. After twenty minutes milling, however, this effect disappears and recovery shows a normal value. They propose the mechanism that the first effect of increased temperature is to cause rapid gel formation—further mechanical action finally breaking down the gel to a polymer of lower recovery. Unpublished work in this laboratory shows that a GR-S polymer with less than 3% gel has a gel content of 18% after one pass through a Gordon plasticator. Upon processing into a master batch with 50 parts of carbon black the gel content rises to 50%*.

The processing of rubber is aided by peptizers which increase the plasticity and reduce nerve. The effect on GR-S of one chemical plasticizer, RPA No. 5, (aromatic mercaptan) has been shown *(32)*. While helpful, this type of plasticizer is not nearly as effective as in rubber.

Kemp *(19)* sheds some light on the behavior with oxygen. He demonstrated that if a 100% benzene soluble GR-S polymer is prepared without the addition of antioxidant and subsequently exposed to air for four days at room temperature, the solubility drops to 30%. "Nevertheless under these conditions no gain in weight could be detected on the ordinary analytical balance. Pure rubber hydrocarbon will absorb oxygen somewhat more rapidly than GR-S rubber hydrocarbon when exposed to air, but unlike the GR-S it remains soluble in chloroform." Furthermore, rubber stocks were found to absorb 0.65% of their weight as against 0.28% for GR-S after twelve days in the oxygen bomb at 50°C. and 150 psi. This shows that rubber takes up more oxygen due to oxidation *(42)*. The type of oxidation products formed in rubber depends not only on the presence of oxygen but on the presence or absence of sulfur *(15)*.

Temperature effects are of interest as they reveal a fundamental difference *(48)* between GR-S and rubber. With increased time of vulcanization, or upon subsequent exposure to heat, GR-S vulcanizates show general hardening, modulus and durometer increase and elongation decrease. Rubber vulcanizates, in contrast, produce softening with decreased modulus and hardness. This tendency of rubber to soften, or revert, is the key to the successful reclaiming of rubber and will be discussed later.

Examining in detail the effect of heat, Neal and Ottenhoff *(31)*, subjected GR-S to accelerated aging tests commonly employed in rubber technology, *viz.*, oxygen bomb, air oven, and air pressure heat test. They corroborate the above statement on hardening. They found that while GR-S retains tensile strength better than rubber, it shows a stiffening in modulus. Both rubber and GR-S lose elongation but the magnitude is much greater for GR-S. The durometer of GR-S stocks increases constantly in all types of aging, whereas rubber shows a slight increase during the early stages of the test and then the hardness decreases. Vila *(48)* examined samples from the Schopper detrition test which had blown out. The GR-S specimens were hard and dry, whereas the rubber specimens were soft and tacky.

As regards the effect of heat alone on natural rubber, Jones *(18)* showed that vulcanizates after being heated in a vacuum for fourteen days at 65°F. showed very little change in stress-strain properties. In this same connection, Reed *(39)* reached a similar conclusion after heating rubber vulcanizates at 90°C. in a vacuum or in nitrogen. Sturgis *(46)* and collaborators found results on GR-S to be diametrically opposed to those for rubber. On heating GR-S vulcanizates for eight days at 100°C. they found the same increase in modulus and durometer, as well as decrease in elongation, whether heating was carried out in air or in nitrogen. They propose the explanation that the deteriora-

* Part of the rise may be due to carbon vulcanization.

tion of an elastomer by heat is largely the result of increased chemical activity, which takes the form of oxidation, continued vulcanization or basic change in the polymer itself. In the case of rubber, oxidation plays the major part; on the other hand, changes produced in GR-S are due to causes other than oxidation. They proceed to demonstrate that continued vulcanization is not a primary factor as regards GR-S, and conclude that the factor of instability of the polymer consisting of further polymerization, cyclization, or similar change, is responsible for hardening.

All of the foregoing work was conducted on commercial GR-S polymers to which an antioxidant had been added before coagulation of the latex. Shelton and Winn *(44)* repeated these experiments on specially prepared polymers containing no antioxidant. Their results differed considerably from previous investigators. The tensile strength of GR-S was radically reduced by heating in air; not so in nitrogen. The addition of antioxidant, however, prevented any loss in tensile strength in air. In regard to modulus, the increase was the same for both oxygen or nitrogen when heating was carried out at 80°C. When the temperature was raised to 100°C., a 50% greater increase occurred in air than in nitrogen. In this case, however, antioxidants offered no protection.

It is apparent that the action of oxygen cannot yet be explained by any simple hypothesis. Turning for a moment to the emulsion polymerization of GR-S, we add to the confusion by noting that during the induction period oxygen disappears and no polymerization occurs till all the oxygen is consumed. Here oxygen acts as a typical inhibitor. Nevertheless, oxidizing agents are added to the system to accelerate the rate of conversion *(54)*.

While many of these observations may appear irrelevant, they are nevertheless presented for, as shown later, our understanding of both vulcanization and devulcanization leaves many gaps and inaccuracies. Consequently, all of the known facts have been reviewed with the hope that some reader may be stimulated to offer a significant deduction.

The Process of Vulcanization

Having pointed out the essential differences between natural rubber and GR-S as known today, we will be in a favorable position to determine what mechanisms are operating in the reclaiming processes after we have briefly considered what is known of the process of vulcanization. Vulcanization may be defined as the change which occurs in the internal structure and in the physical and chemical properties of elastomers by heating with sulfur.

It is known that an unsaturated system, containing double bonds, is necessary for vulcanization, as a completely saturated polymer, such as isobutylene, will not vulcanize. Setting out from here we are at the outset confronted with a difficulty: "No satisfactory explanation of vulcanization has yet been developed" *(30)*.

Kemp *(20)* outlines the conditions for such a satisfactory explanation. "An acceptable explanation of vulcanization must be accompanied with data showing the exact nature of the rubber molecules and the chemical changes occurring during vulcanization which account for the physical changes involved."

It is not the purpose of this paper to go into the details of the theories of vulcanization. An excellent resume may be found in "Chemistry and Technology of Rubber" edited by Davis and Blake. It is sufficient to point out the main conflicting theories: (1) that rubber combines with sulfur chemically; (2) that colloidal changes take place.

There is still a good deal of controversy on this subject. The theory of direct combination of rubber with sulfur at the double bonds to join two chains together by sulfide links through primary valence bonds holds most favor. Yet as late as 1942 Midgley *(27)* said, "there is not a single piece of sound evidence that it is true and many that it is not. During the early stages of gel formation, that is, slight vulcanization, the gel can be peptized by various agents. Who ever heard of peptizing primary linkages?"

Midgley here was leaning heavily on the work of Williams *(51)* who showed that if to a cement, lightly vulcanized with an ultra accelerator, additional accelerator were added, the gel would be reduced to a mobile liquid. In certain instances the resulting liquid would again gel and might again be peptized by the addition of more accelerator. In further work Williams *(50)* showed that the process of peptizing a lightly vulcanized rubber cement does not require the presence of oxygen. He concludes that vulcanized rubber can be peptized under conditions which do not appear to rupture sulfide linkages and that no direct evidence exists to support a sulfide linkage theory of vulcanization.

Selker and Kemp *(43)* were not able to duplicate Williams' work. They claim that Williams' type of peptization is due to oxygen breakdown of rubber catalyzed by accelerators or antioxidants for they could obtain no clear solution in the absence of oxygen. They go on to say that, "Peptization of a sulfur-vulcanized rubber in a solvent which does not attack sulfur linkages is dependent on oxygen degradation of rubber rather than on the simple solution of molecules held together by secondary forces. The same explanation has been given for transformation of gel rubber into sol by traces of oxygen. Thus, the theory that intermolecular combinations of sulfur with rubber is responsible for vulcanization is not negated by Williams' observations that certain vulcanizates are dispersible in the solvents studied, in the presence of oxygen."

Selker and Kemp *(43)* proceed further to show that a rubber vulcanizate dissolves in *p*-dichlorbenzene in 80 minutes at 174°C. in the presence of air, whereas in a vacuum, or in the presence of nitrogen, it will not dissolve even after 24 hours treatment. Hauser and Brown *(55)* also found that it took approximately three times as long to dissolve a rubber vulcanizate in *p*-dichlorbenzene when heated in a stream of nitrogen as in air.

To demonstrate still more versatility in the structural potentialities of elastomers, Busse *(3)* states that many materials stiffen rubber or make it unable to disperse in solvents. These include many organic materials as well as magnesium oxide and carbon black. This phenomenon suggests that cross bonds may be formed by widely differing mechanisms.

Many gaps must be filled and all of the above-mentioned inconsistencies must be reconciled during the course of verification of any complete theory of vulcanization. This theory must also explain the action of the many organic, non-sulfur vulcanizing agents.

One final observation. Rather disturbing is the work done by Hauser, LeBeau, and Kao *(14)* wherein they showed that vulcanization of the individual par-

ticles of rubber in the latex state yields, upon drying, a film of tensile strength up to 5000 psi. What, then, is the significance of this work in view of the commonly accepted belief that vulcanized rubber has no tack or cohesion?

The Process of Reclaiming

The process of reclaiming starts with rubber in the vulcanized state. How, then, can an explanation of reclaiming be formulated when the starting point is so uncertain? The limitations of workers in this field are obvious for they are dependent on the prior establishment of a clear understanding of vulcanization.

Nevertheless, with this handicap in mind what is our present understanding of the mechanisms involved in the reclaiming of rubber? As background we may refer to a complete review given by Miller *(29)*. An extensive literature review on the more practical aspects is listed by McPherson *(26)*.

The process of reclaiming is based on historical development rather than on the application of any complete theory at any one time. Reclaiming is essentially a method for converting vulcanized material into a form in which it may be used again. The state of this science, or rather industrial art, is not entirely successful today, that is, a product prepared from reclaimed rubber is inferior in properties to one prepared from new material.

"The principle underlying all (rubber?) reclaiming processes is reversion" *(7)*, the change to a soft, workable, tacky mass taking place when vulcanized rubber is heated. During vulcanization rubber changes from a plastic to an elastic state; continued heating changes it back again to a plastic state. To understand this better we may attempt to reconcile the tremendous change in the physical properties brought about in unvulcanized rubber by only the very small amount of sulfur that combines during vulcanization. It has been proposed that sulfur acts as a polymerization catalyst in addition to a cross-linking agent *(52)*. The polymerized, sulfur-free chains under continued heating rupture into smaller aggregates which no longer have the structure for obtaining optimum physical properties, that is, cohesion has been lessened with resulting softening *(29)*.

Reclaiming is ordinarily accomplished by subjecting scrap rubber to the action of heat in the presence of plasticizers. This is followed by a sheeting process on a mill operating at a high friction ratio with a roll clearance of a few thousandths. The overall effect is to plasticize the rubber, remove those portions not affected and blend and homogenize the remainder.

Examining this phenomenon more formally it may be said that the various processes for reclaiming rubber make use of singly, or in combination, these four factors:

1. Energy
2. Solvent swelling
3. Chemical plastication
4. Mechanical disintegration

Heat energy is used in a thermodynamic sense to speed up the reaction rate, the nature of which may be swelling, oxidation, or other type of degradation as well as reversion. Penetrating solvents, or non-volatile plasticizers, are used to swell the rubber matrix reducing van der Waals' association forces, thus allowing slippage and plastic flow during refining. The role of chemical plasticizers is not entirely clear. They may act simply as oxygen carriers or perhaps as true "peptizers." And finally, mechanical disintegration during refining completes the process; tremendous shearing forces are exerted on the material in the nip of the refiner, disintegrating any residual gel structure at points of strain.

The process of vulcanization is irreversible *(29)*. Technical devulcanization is not the reverse of vulcanization—it is merely plasticization. Quite severe laboratory methods *(45)* have attempted to remove combined sulfur with negative results. Seemingly, though, combined sulfur need not be removed to achieve a usable material. This may be accomplished by a change of state obtained by molecular disaggregation.

The above interpretation is dependent largely on hypothesis—direct confirmation is lacking. What little evidence there is available is based largely, though not entirely, on the significant contribution of Winkelmann *(53)*, who demonstrated that the chloroform-soluble portion of reclaim increased with time of devulcanization. He further showed that 43.5% of the total rubber content of a reclaim was chloroform soluble but that this soluble portion contained only 7% of the combined sulfur. Apparently breakdown takes place geometrically between the sulfur linkages, for the extract after vulcanization with sulfur is only 2.3% chloroform soluble.

Further work along these lines by Kirchhof *(23)* related the chloroform-soluble and the soluble portions respectively to the gel and sol of crude rubber. It would thus appear that reclaiming transposes the molecular weight distribution curve to a lower region. Continuing on the same subject, Miller *(28)* successively reclaimed and vulcanized rubber four times. The reclaim became progressively more difficult to devulcanize after each cycle; the combined sulfur increased continuously and the chloroform-soluble portion became lower.

Oxygen is necessary for reversion. On the other hand, while oxygen appears to play a vital role in the reclaiming process, Hughes and Amphlett *(16)* maintain that its effect during reclaiming has never been fully established as no oxygen-free experiments have ever been run. Rubber itself contains about 5% dissolved air, and tread stocks may contain oxygen on the carbon surface to the extent of 50% of the rubber volume. The importance of oxygen in reclaiming has been inferred mainly from its effect on raw rubber either during heating or milling *(12)*. Several patents *(22, 17, 11)* claim the use of air or oxidizing salts in reclaiming to produce less tailings, increase straining speed, or reduce time of devulcanization.

From what has been said it is clear that the essential factors, both obvious and obscure, influencing devulcanization are quite complex. In regard to vulcanization, Garvey *(13)* has stated that along with the main vulcanization reaction many side reactions go on simultaneously and it is, therefore, difficult to isolate the main reaction. It seems to this author that this is the key to the explanation of not only vulcanization, but also of devulcanization—that only a multiple component interpretation will explain all the observable facts.

Before leaving the topic of devulcanization we wish to pose one last question which need be reconciled before the final explanation of reclaiming mechanisms is given. Why can cured rubber be ground to a fine crumb, placed in a mold with additional sulfur and accelerator, and cured out into a homogeneous product of good tensile strength?

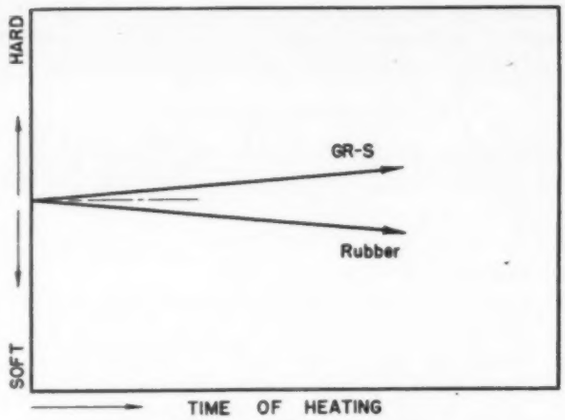

FIG. 1—Heat alone.

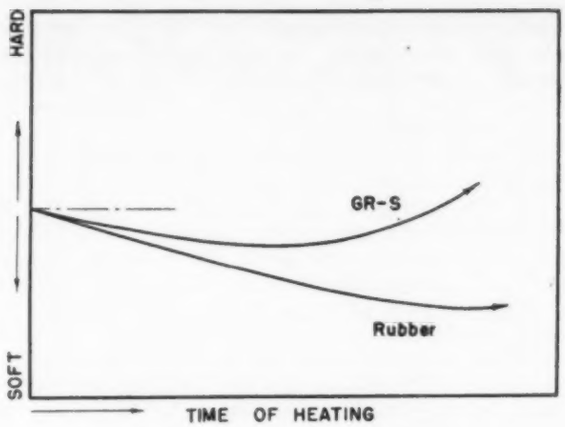

FIG. 2—Heat and softener.

Problem of Reclaiming GR-S

What has been developed thus far? We have tried to show how GR-S compares to rubber: it differs in chemical constitution; in molecular weight distribution; is amorphous under all conditions; is more resistant to chemical attack and decomposition by heating; is more resistant to poisons or catalytic oxidation as well as ordinary oxidation; absorbs less oxygen; has less effective cross links with sulfur; has low tensile strength in gum stocks; has benzene rings in the side chains; has chain filaments more widely spaced; has properties which deteriorate more at elevated temperatures; its plasticity is less affected by milling; its gel content increases on milling; if does not revert on heating in air.

We have inquired into the present conception of vulcanization, a topic of much controversy. A general statement, more or less acceptable, would be that changes occurring during vulcanization are due to some interaction of rubber with sulfur, accompanied to an unknown degree by polymerization, cyclization, aggregation by secondary van der Waals' forces and the formation of cross bonds from carbon vulcanization or other compounding ingredients.

We have discussed the mechanism of rubber reclaiming and find a general lack of understanding caused to a large extent by the absence of a satisfactory explanation of vulcanization. Nevertheless, reclaiming is technically successful because rubber reverts, or becomes plastic, when heated in the presence of oxygen. This is aided by the use of swelling solvents, chemical plasticizers and mechanical disintegration.

This brings us to the final point: How may the foregoing information be interpreted to indicate a possible solution to the reclaiming of GR-S?

GR-S does not respond to reclaiming agencies in the same manner as rubber. The predominating difference is that it will not revert on heating in the presence of oxygen; instead it stiffens, becomes harder and drier. Very few chemical peptizers for GR-S are known and these are not too effective. Of the four factors mentioned above for reclaiming rubber there remains for use only the factors of penetrating solvents and mechanical disintegration. These have been employed by the reclaiming industry to partially solve this problem. By using large amounts of plasticizers with a minimum of heat treatment followed by sufficient refining, the structure of GR-S vulcanizates may be broken down.

The foregoing analysis is demonstrated by Figures I, II, and III. Figure I shows that rubber softens when subjected to heat and oxygen; under the same conditions GR-S hardens. Figure II shows the effect of added plasticizers wherein swelling and softening take place aided by heat. Should heating be continued long enough a maximum swelling will be reached; thereafter hardening begins. Figure III demonstrates the effect of the addition of a chemical peptizer wherein the magnitude of the plasticizing action is increased and the time before hardening starts extended. Should very powerful peptizers be discovered, they may in all probability overcome the effects of heating to cause continual plasticization.

The search for chemical peptizers and more effective plasticizers and penetrants is on. GR-S reclaims use substantial quantities of plasticizers, aided by just enough heat to cause swelling, but insufficient heat to cause hardening. As an illustration of the overall difference in behavior between GR-S and rubber we may cite the preparation of a rubber reclaim by the addition of ten parts of pine tar to cracked tread scrap and heating for six hours at 200 pounds steam. After refining, a reclaim with a Mooney plasticity value of 50 is obtained. Under the same conditions, to obtain an equivalent plasticity, GR-S requires the addition of 40 parts of pine tar. Although this is not an example of a particularly good reclaim, it demonstrates the type of approach that has been used to

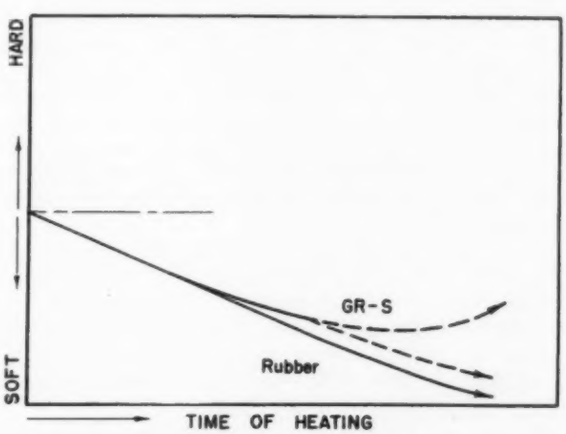

FIG. 3—Heat, softener and chemical plasticizer.

prepare commercially acceptable GR-S reclaim. As such, with reservations, we may agree with Conover *(6)* who states that the reclaiming of all currently important types of synthetic rubber has been successfully accomplished.

We believe that substantial improvements in both methods and materials are still needed. Three papers *(38, 21, 1)* have quite recently appeared reviewing the compounding and processing problems of GR-S reclaim. The authors are generally in agreement that GR-S reclaims compare favorably with rubber reclaims for they have good physical properties and produce satisfactory soft and hard rubber formulations. These reclaims suffer from a lack of tack, are tougher* and cure slower. They seem to be somewhat better processing and give excellent extruded and calendered sections; the details of compounding are somewhat different than for rubber. GR-S reclaim is more expensive than rubber.

Problem of Reclaiming Mixtures

Though not by any means complete, the solution of the problem of reclaiming GR-S is far enough advanced to be classed as not critical. The much greater problem still remaining is reclaiming of mixtures. There are many thousands of recapped tires on the road and in our scrap yards with natural rubber carcasses and GR-S treads. In addition, factory generated scrap is composed of all the various polymer types in commercial production. We may expect tires of the future to incorporate blends of synthetics and natural rubber for compounders will in all probability find advantages in such blends. Since the different synthetics and natural rubber all respond in varying degrees to reclaiming treatment, modern techniques will not suffice to handle mixtures successfully. New developments are needed.

Though this particular problem seems formidable, problems of this magnitude are not new to the reclaiming industry. Go back for a moment to the beginnings of reclaim history when all scrap was unvulcanized. A reclaimer had then merely to remill his scrap or, if it contained fabric, dissolve the rubber out with a solvent. Goodyear's discovery of vulcanization leveled a body blow at recovery operations and presented the seemingly insurmountable problem of learning how to reclaim vulcanized rubber. However, this was successfully solved after many attempts by the ingenuity of Messrs. Mitchell and Marks.

Each successive advance in the art of compounding rubber has presented the reclaimer with new problems, as his raw material has successively become tougher, more tightly vulcanized, and harder to breakdown than before. Among these changes influencing reclaiming operations was the discovery of organic accelerators by Oenslager in 1906, followed by the use of reinforcing carbon black in 1915, and later by the use of antioxidants in 1922.

The reclaimer not only met these changes successfully, but in acquiring improved techniques improved also the quality of his product. Today he is faced with the necessity of learning how to reclaim mixtures of natural and synthetic rubbers. He must find a "universal" process which will handle any combination of materials, whatever their proportion or composition, known or unknown. With his past record of accomplishments we have no doubt as to his success.

* The increased toughness of GR-S reclaims is a direct result of the lack of reversion which has been only partially compensated for by the additional amount of softeners.

ACKNOWLEDGMENT

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Division of Rubber Chemistry to Meet in Atlantic City on April 10, 11, 12

THE first meeting of the Division of Rubber Chemistry of the American Chemical Society since the Spring of 1944, will be held in Atlantic City, N. J., on Wednesday, Thursday and Friday, April 10, 11 and 12, in conjunction with the 109th meeting of the parent society. The last meeting held by the Division was staged at the Hotel Commodore in New York City on April 26, 27 and 28, 1944. Headquarters for the Division at Atlantic City will be the Hotel Ambassador, but all technical sessions will be held at Convention Hall.

The meeting of the Division will feature the presentation of between 35 and 40 technical papers, on the usual wide variety of rubber subjects; the long-delayed Charles Goodyear Lecture by Dr. Waldo L. Semon, director of pioneering research of the B. F. Goodrich Co., and the divisional banquet. Dr. Semon's lecture, under the title of "Research Leading to Commercial Synthetic Rubber," will be given on Thursday morning, April 11. The banquet will be held on Thursday evening, at the Hotel Chelsea. Tickets for the banquet, at $5.00 each, can be secured in advance from William B. Dunlap, Jr., c/o Lee Rubber & Tire Corp., Conshohocken, Penna. Entertainment for the banquet has already been arranged. A business meeting will be held on Friday morning.

The special committee in charge of arrangements for the meeting of the Rubber Division is headed by Harry Bimmerman (DuPont), and includes the following: *Entertainment,* Sam Martin (Thiokol); *Banquet,* William H. Ayscue (DuPont); *Housing,* Larry Youse (Gilmer); *Tickets,* William B. Dunlap, Jr. (Lee Rubber). Members of the committee may be consulted on various phases of the meeting.

To Hold High Polymer Forum

Of special interest to members of the Rubber Division is "The High Polymer Forum" which will be held by the A.C.S. at Atlantic City on Tuesday, April 9, and the morning of Wednesday, April 10. The Forum is sponsored by the Division of Paint, Varnish and Plastics Chemistry, with the cooperation of the Divisions of Cellulose Chemistry, Colloid Chemistry, Organic Chemistry, Physical and Inorganic Chemistry, and Rubber Chemistry. It includes a Symposium on the "Physical Chemistry of Copolymers and Copolymerization," arranged by the Division of Physical and Inorganic Chemistry, and features 16 papers in all, four of which will comprise the special symposium. For the benefit of our readers, the entire program of "The High Polymer Forum" is published elsewhere in this issue.

Abstracts of the papers to be delivered at the meeting of the Rubber Division (as of this writing), together with their authors and company connections, follow:

Program of the
DIVISION OF RUBBER CHEMISTRY
AMERICAN CHEMICAL SOCIETY

Hotel Ambassador—Atlantic City, N. J.
(Technical Sessions at Convention Hall)
April 10, 11 and 12, 1946

Wednesday Afternoon—April 10

1:30 P.M.—Introduction, by Dr. W. A. Gibbons (U. S. Rubber), Chairman, Rubber Division, A.C.S.

1:40 P.M.—General Papers.

Thursday Morning—April 11

9:00 A.M.—General Papers.

10:55 A.M.—Charles Goodyear Lecture, "Research Leading to Commercial Synthetic Rubber," by Dr. Waldo L. Semon (Goodrich).

11:30 A.M.—General Papers.

Thursday Afternoon—April 11

2:00 P.M.—General Papers.

Thursday Evening—April 11

6:30 P.M.—Division Banquet, Main Ballroom, Hotel Chelsea.

Friday Morning—April 12

9:00 A.M.—General Papers.

11:45 A.M.—Business Meeting.

Friday Afternoon—April 12

2:00 P.M.—General Papers.

ABSTRACTS OF PAPERS

Wednesday Afternoon—April 10

1:30 P. M.—Introduction. ***W. A. Gibbons (U. S. Rubber Co.).***

1:40 P. M.—Purification and Emulsion Copolymerization of Isoprene. ***C. F. Fryling (Phillips Petroleum Co., Bartlesville, Okla.).***

The determination of rate of copolymerization was applied as a control to the purification of isoprene with the following results:

1. "Research Grade" and "Pure Grade" isoprenes were prepared which, when copolymerized with styrene in the Mutual recipe, exhibited 11-hour conversions of 67 and 66 per cent respectively.

2. These conversions compared very favorably with a conversion of 67 to 68 per cent obtained with SO_2-purified isoprene.

3. The results indicated that both high and low boiling inhibitors were removed from the isoprene by large scale slow distillation.

4. The polymerization technique applied to isoprene was improved to the point where duplication of conversions of ± 0.2 to 0.3 per cent could be attained. This technique employing crown cap bottles is described in detail.

5. The physical properties of the various pure isoprene sam-

ples, such as refractive index, density, and freezing point, duplicated closely those published by the National Bureau of Standards.

6. The rubbers produced with pure isoprene exhibited a tendency to over-cure, which can be readily corrected by proper compounding, and exhibited improved heat-aging properties as compared with GR-S.

2:00 P. M.—Emulsion Polymerization of Diene Hydrocarbons. *H. W. Starkweather, A. S. Carter, F. B. Hill, Jr., V. R. Hurka, P. A. Sanders, H. W. Walker, and M. A. Youker (Jackson Laboratory, E. I. du Pont de Nemours & Co., Wilmington, Del.).*

The results obtained in an extended investigation of the emulsion polymerization of diene hydrocarbons to yield rubber-like polymers are summarized. Variables which may affect the rate of polymerization or properties of the products, such as purity of reagents, monomer-water ratio, type and concentration of emulsifying agents, pH of emulsion, method of preparation of emulsion, temperature of polymerization, catalysts and certain added chemicals, product yield, method of coagulation and processing of coagula, are discussed.

Convenient forms of equipment for the small scale preparation, compounding and testing of new types of elastomers are described.

Data obtained with elastomers formed by the emulsion polymerization of such dienes as 1, 3-butadiene, isoprene, and 2, 3-dimethyl 1, 3-butadiene, alone and in mixtures are presented.

The properties of elastomers obtained from mixtures of butadiene with various amounts of a few typical vinyl compounds are discussed. The influence of the structure of the second monomer and variations in the monomer ratio upon typical properties such as stress-strain relationships, freeze resistance and chemical resistance is indicated, with conclusions regarding the effect of certain substituent groups. Attention is called to some methods for distinguishing between true interpolymers and mixed polymers.

Graphs are presented showing the influence of both primary and secondary catalysts upon the polymerization rates.

The influence of modifying agents, such as mercaptans, upon the polymerization and the plasticity of typical copolymers is considered, with a comparison of the effects of various mercaptans.

The products formed from butadiene with over 200 representatives of various classes of polymerizable compounds, such as hydrocarbons, substituted hydrocarbons, hydroxy compounds, aldehydes, ketones, ethers, carboxylic derivatives, nitriles, amides and heterocyclic compounds, have been investigated. These results are summarized in this report.

2:30 P. M.—Properties of Lactoprene EV. *T. J. Dietz, W. C. Mast, R. L. Dean, and C. H. Fisher (Eastern Regional Research Laboratory, Philadelphia 18, Penna.).*

The compounding and curing characteristics of Lactoprene EV elastomer (95 per cent ethyl acrylate + 5 per cent chloroethyl vinyl ether copolymer) and certain properties of its vulcanizates are described.

The polymer compounds satisfactorily on a hot 6" x 12" laboratory mill, provided a suitable release agent, such as stearic acid, is used to insure retention of the stock on the front roll. Curing time of the compounded stock at 298° F. varies from 30 minutes up, depending on the formulation. Slow-curing stocks tend to adhere strongly to the mold unless a lubricant is used. Mold lubricants customarily employed with other synthetic rubbers are usually unsatisfactory for Lactoprene EV. A special lubricant designed for use with this product is described.

Special properties in which Lactoprene EV vulcanizates surpass the diene synthetics are emphasized in this paper. Heat-aging tests demonstrate that the product is outstanding in its resistance to high temperatures. Suitably formulated vulcanizates exhibit serviceable tensile properties after 300 hours at 300° F. Lactoprene EV is also superior in its resistance to paraffinic hydrocarbons. When immersed in a standard reference oil at 70° C. for 168 hours, its volume-increase is of the order of 2 per cent. It swells markedly in aromatic hydrocarbons and the lower alconols, however, and the volume-increase in water is comparatively high (14 per cent in 72 hours at 25° C.).

2:45 P. M.—Copolymers of Dimethyl Styrene and of Vinyl Fatty Acid Esters with Butadiene. *P. O. Powers (Armstrong Cork Co., Lancaster, Penna.).*

After studying a large number of raw materials for synthetic rubbers, two classes of materials, a *p* dimethyl styrene and vinyl fatty acid esters have given promise of producing rubbers of improved physical properties. *p* Dimethyl styrene has been copolymerized in emulsion with butadiene in various ratios. The copolymers are easily processed, and their tensile strength is greater than the corresponding butadiene-styrene copolymers. The tensile strength increases with the amount of dimethyl styrene at least up to one part of dimethyl styrene to two parts of butadiene. The polymerization was carried substantially to completion. Better properties were obtained with lower temperatures of polymerization.

Vinyl fatty acid esters have been prepared from acetylene and the acids from drying and non-drying oils. These vinyl esters do not polymerize readily but copolymers with butadiene are readily formed by emulsion polymerization containing up to 20% vinyl esters. These copolymers are rather soft and not particularly interesting. Tricopolymers from butadiene and vinyl esters with styrene possess rubber-like properties. When vinyl esters of the drying oils are used, the copolymers exhibit good resistance to cut growth. When acrylonitrile is used as the third component, oil resistant rubbers are obtained. 10%-15% of vinyl esters are used to the best advantage.

3:05 P. M.—Some Properties of Silastic at Elevated Temperatures. *C. M. Doede, G. DiNorscia, and A. Panagrossia (Connecticut Hard Rubber Co., New Haven, Conn.).*

The physical properties of some Silastic compositions as a function of temperature are presented in comparison with the properties of natural rubber and some of the present synthetic rubbers under the same conditions. The properties studied include stress-strain relationships, hardness, elasticity, permanent set or non-recoverable deformation under stress, dielectric strength, ozone resistance and solvent resistance. The data show how these properties of the various polymers change with temperature. The properties of natural rubber stocks fall off rapidly at temperatures above 100° C. Compositions of neoprene and Buna N polymers are stable in the range up to 150° C. Silastic maintains physical stability up to 250° C.

3:20 P. M.—Improved Types of GR-S Using Rosin Soap As An Emulsifier. *W. S. Coe and J. L. Brady (Naugatuck Chemical Division, U. S. Rubber Co., Naugatuck, Conn.).*

It is well known that standard GR-S utilizes fatty acid soap as an emulsifier, in turn converted to free fatty acid when flocculated. During the early phases of the Government synthetic rubber program, it was shown that rosin acid soap could be substituted for fatty acid soap in the GR-S system with formation of polymer of good quality. Interest in this development was accelerated when it was observed that the polymer was quite tacky compared with standard GR-S and limited plant scale production was inaugurated during June of 1943 under the code of GR-S:X-10.

Subsequent experience in the building of tires from the rosin soap GR-S showed that considerably better quality was obtained because of superior adhesion between cords and adjacent carcass compounds. Further evaluation has demonstrated additional advantages, notably, better tensiles in low black compounds or with non-black pigment loadings. The better reinforcement noted has sometimes resulted in better tread wear.

Rosin soap GR-S is now available in unlimited quantities under the designation GR-S:10. A non-discoloring, non-staining variation is also available under the code GR-S:X-273. Because of the lack of free fatty acid the rosin soap polymers break down somewhat slower and require more mastication. For the same reason, curing rates are slower than with standard GR-S and this must be compensated for by adjustment of accelerator ratio.

3:40 P. M.—Continuous Buna S Preparation. ***J. J. Owen, C. T. Steele, P. T. Parker (Standard Oil Company of New Jersey, Baton Rouge, La.) and E. W. Carrier (Standard Oil Development Co., Elizabeth, N. J.).***

An investigation of the continuous preparation of Buna S on a laboratory scale was begun in May, 1941, at the Esso Laboratories of the Louisiana Division of the Standard Oil Co. of New Jersey. The continuous process was investigated in one-stage, three-stage and five-stage systems, the additional stages being added to minimize "short-circuiting." Runs varying from 45 to 618 hours were made during which the number of stages, percentage conversion, amount and manner of catalyst and modifier addition, hydrogen ion concentration, and water to hydrocarbon ratio were the principal variables investigated. The data from these runs indicated that:

1. Under comparable conditions and at the same conversion levels the products from the one-, three-, and five-stage operation showed very similar properties. The product evaluation data did not show the appreciable advantage expected in increasing the number of stages.

2. Under conditions equivalent to those employed in batch operation, the reaction rates were slower but could be increased by increasing the reaction temperature and by the inter-stage injection of additional catalyst.

3. A Buna S of good quality equivalent to that obtained in typical batch operation was produced either by lowering the conversion level or at higher conversion levels by certain modifications of the reaction conditions, including: (a) interstage addition of modifier, (b) interstage addition of catalyst, (c) decreasing the water to hydrocarbon ratio, and (d) lowering the pH of the soap solution.

The results of this study indicated that the continuous production of Buna S was entirely feasible.

4:00 P. M.—Development of a Better Processing GR-S. ***D. L. Schoene, A. J. Green, E. R. Burns, and G. R. Vila (Naugatuck Chemical Division, U. S. Rubber Co., Naugatuck, Conn.).***

Early studies on the plastication of GR-S and related polymers revealed that hot breakdown of the raw polymer gave a resulting compound which tubed smoother and exhibited less swelling at the die. It was also observed that under certain conditions hot plastication caused the raw polymer to become less viscous and progressively less soluble in benzene indicating the formation of a cross-linked molecular structure accompanied by chain scission.

It has now been found possible to duplicate and surpass the effects of plastication by controlling molecular structure during polymerization. A critical experiment illustrating this principle lies in the comparative processing properties of standard GR-S of 50 Mooney viscosity and a GR-S produced by blending a very high Mooney component and a very low Mooney component to the same 50 Mooney value. The latter will be found to tube much smoother, exhibit greatly reduced calender shrinkage and swell considerably less at the die. The presence of a benzene insoluble gel component may be demonstrated in the blended polymer as well as on inordinately wide molecular weight distribution.

Another approach for producing a similar alteration in molecular structure lies in the introduction of a difunctional cross-linking agent such as divinyl benzene into the polymerization formula. Under these conditions comparable improvements are noted. This approach has proved to be more immediately practical than the blending technique and polymer of this type has been made in copolymer plants on a production scale and is currently available in limited quantities.

This new type of improved processing GR-S can be used to best advantage in blends with standard GR-S in any proportion depending on the properties desired. Inasmuch as its molecular pattern differs radically from standard GR-S, certain alterations in compounding are necessary to fully realize maximum potentialities.

Thursday Morning—April 11

9:00 A. M.—The Effect of Polymolecularity on the Deformation Charactristics of Butyl Polymers. ***R. L. Zapp and F. P. Baldwin (Standard Oil Development Co., Elizabeth, N. J.).***

It is well known that variations of conditions and courses of reaction during polymerization affect the heterogeneity of molecular weight of high polymeric materials. The degree of heterogeneity profoundly affects the deformation characteristics of elastomers. Because Butyl polymers are linear molecules and relatively stable, the isolation of fractional molecular weight components, their blending and study of deformation characteristics are facilitated. Narrow fractions as well as blends of varying molecular weight distribution (for a constant average molecular weight) were studied under conditions of constant deformation rate and constant load.

Under constant deformation rate conditions, it was noted that the temperature required to appreciably reduce the elastic component of deformation is directly related to molecular weight. In other words, even the highest molecular weight polymers would be capable of forming operations if sufficiently high temperatures could be tolerated. When average molecular weight is held constant, decreasing the molecular weight distribution results in a more thermoplastic material. From this observation it can be postulated that the narrower the molecular weight distribution the higher is the viscosity average molecular weight that can be tolerated for a given level of processability.

Under conditions of constant load, a method has been devised for experimentally isolating the elastic and viscous components of deformation. By this technique it is shown that a contraction in molecular weight limits (for a constant average molecular weight) is followed by a reduction in elastic deformation while viscous flow remains constant. In other words, variations in molecular weight distribution are manifested in differences in elastic modulus, but the plastic flow is dependent only on average molecular weight. Thus a plastometer method for indicating a viscosity or weight average molecular weight is available, for the logarithms of the viscous flow rates obtained by this technique are related to the square root of the viscosity average molecular weight by an expression similar to the Flory equation, $\log \eta = A + CM_w^{1/2}$.

9:20 A. M.—The Effect of Molecular Weight Distribution on the Physical Properties of Natural and Synthetic Polymers. ***B. L. Johnson (Firestone Tire & Rubber Co., Akron, Ohio).***

Weight average molecular weight distributions of natural polymers have been determined and compared with those of butadiene-styrene copolymers. The maxima in weight distribution of unmilled, naturally occurring rubbers appear at dilute solution viscosities which range from less than one-half in the case of *Solidago leavenworthii* to ten for No. 2 ribbed smoked sheet.

Plastication softens the gel of Hevea rubbers but increases its amount while cold milling reduces the amount of gel. The weight distribution of Hevea is lowered and broadened very much by plastication. Cold milling also lowers the viscosity at which the maximum in weight distribution appears but does not eliminate it.

The tensile strength of the vulcanizates rises rapidly with dilute solution viscosity up to a value of about 1½. At higher viscosities the curve for the relation between tensile strength and viscosity begins to level off. The efficiency of the polymers continues to rise in this range in which the ultimate strength does not depend on the chain length. The tread wear in tires also continues to improve with increased dilute solution viscosity in this range.

The weight average molecular weight distribution of GR-S is such that about 40 per cent of the polymer consists of material below one in dilute solution viscosity. This material has been shown to have a deleterious effect on physical properties and tread wear. Indications were obtained that the gel portion of GR-S was not as detrimental as the low molecular weight material.

9:40 A. M.—Correlation of Tensile Strength with the Brittle Points of Vulcanized Diene Polymers. ***A. M. Borders and R. D. Juve (Goodyear Tire & Rubber Co., Akron, Ohio).***

The data presented in this report were collected to determine the validity and extent of the general observation that changes in diene copolymer composition which improve the tensile strength, cut crack growth resistance, etc., of the vulcanizate, do so at the expense of a higher brittle point. A number of butadiene and isoprene copolymers were prepared in varying ratios with styrene, vinylpyridine, acrylonitrile, mono-, and dichloro-styrenes. Stress-strain determinations at 27° and 90° C. and brittle point tests were made for tread vulcanizates of each copolymer.

To illustrate the dependence of tensile strength upon the brittle points, the maximum tensile strength observed for each rubber was plotted against ΔT, where ΔT represents the difference (in °C.) between the temperature at which the tensile determination was made and the brittle point of the compound. As ΔT decreases, the tensile strength of all the isoprene and butadiene copolymers studied increases. Thus those polymers with the highest brittle points have the highest tensile strength, both at room and elevated temperatures.

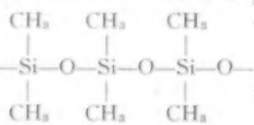
Points for all the btuadiene copolymers form one band upon this plot. Those for isoprene rubbers fall slightly lower, *i.e.*, with a lower tensile strength for a given brittle point. Tensile values of Hevea tread stocks at several temperatures are included on the same graph, showing a marked superiority in tensile strength at a given ΔT for the Hevea compound.

The data show that the commonly observed low hot tensile strength of GR-S compounds is not the result of an abrupt weakening at higher temperatures, but merely that the temperature of measurement (93° C. in this laboratory) is farther from the brittle point of the rubber than in the case of copolymers with higher tensiles at 93° C.

Similar measurements of Neoprene GN and Butyl compounds showed the points of tensile strength vs. ΔT to fall within the band observed for the butadiene copolymers. A discussion is given of the way in which other physical properties may fit into this relationship and of possibilities of overcoming the limitations observed.

10:05 A. M.—Osmotic Pressure Measurements with Polydimethylsilicone Fractions. ***D. W. Scott (General Electric Co., Schenectady, N. Y.).***

A sample of high molecular weight polydimethylsilicone



has been divided into five fractions by precipitation from solution, using ethyl acetate as solvent and acetone as precipitant. The range of precipitant concentration within which most of this polymer is thrown out of solution is unusually narrow. This behavior is due to the predominance of very high molecular weight species in the polymer.

Osmotic pressure data have been obtained for solutions of the four highest molecular weight fractions in methyl ethyl ketone. The osmotic pressures of these solutions have a high temperature coefficient; in one extreme case a doubling of the osmotic pressure with a 10° rise in temperature has been observed.

The osmotic pressure data for the four fractions yield number average molecular weight values of 2.8×10^6, 1.8×10^6, 6.1×10^5, and 2.9×10^5. With such high molecular weights, it is surprising that only the highest molecular weight fraction shows any rubber-like elasticity, the other three fractions being soft plastic materials.

10:20 A. M.—X-Ray Fine Structure of Synthetic Rubbers. ***W. O. Baker and N. R. Pape (Bell Telephone Laboratories, Murray Hill, N. J.).***

The physical properties of synthetic rubbers made from butadiene or isoprene polymers and copolymers differ so much from those of natural rubber, that the crystallizing or ordering ability peculiar to Hevea was recognized nearly 20 years ago (by J. R. Katz) to be of profound technical significance.

The meaning of this behavior of Hevea to the present quest for good artificial rubbers can be made more specific. Molecular order induced mainly by high, periodic forces between the chains only enhances tenacity at the cost of rubberiness. It raises brittle point and gives properties of a plastic. On the other hand, the intrinsically weak interaction of natural rubber chains is so integrated when stress is applied, that notable strength and "crystallinity" arise, without excessive stiffening. Thus, the crucial elements seem to be (1) easily attainable local order, (2) rapid order-disorder transformation as stress varies.

The first element was studied by interpretation of silver nitrate poly-diene complexes [observed to form with Hevea by Kratky, Philipp, Posnansky and Schossberger, *Naturwissen*, Vol. 26, p. 123 (1938)]. The X-ray scattering of these complexes suggests that polarizable, double, bonds in the polymer chains are so disposed, in adjacent chains, that ordered association with Ag ions occurs. By contrast, characteristic but disordered patterns are found from $AgNO_3$-polymer complexes containing synthetic diene polymers and copolymers (except polychloroprene). Apparently, chains in GR-S, polybutadiene (polyisoprene shows signs of order), etc., lack the local arrangement, unstretched, necessary for order and reinforcement on stretching. For example, $AgNO_3$ complexes have different structure with *cis* (higher coordination) than with *trans* (lower coordination), so that a *cis-trans* mixture in polybutadiene, as well as 1:2 addition, would presumably cause disordered complexes, as observed.

The second factor, rapid order-disorder transformation with varying stress, means that crystallites must be quickly destroyed by energy kT if the rubber is to relax after stressing, and not stay oriented like a textile fiber. While speed and heat of retraction have previously been used to study this, another way is to see at what temperature usable rubbers disorder even when stretched. This temperature range is 40-50° C. for Butyl and a model system, Paracon. Although higher values have been reported for Hevea [von Susich, *Naturwiss.*, Vol. 18, p. 915 (1930)], extensive crystallinity probably should not persist above 50° C. for a good rubber.

10:55 A. M.—Research Leading to Commercial Synthetic Rubber. ***Waldo L. Semon (B. F. Goodrich Co., Akron, Ohio).*** **Note: This is the Charles Goodyear Lecture.**

No abstract available.

11:30 A. M.—The Sulfur Bond in Vulcanizates. I. Implications of Halogen Reactions. ***S. R. Olsen (Irrigation Branch Experiment Station, Department of Agriculture, Prosser, Wash.), and C. M. Hull and W. G. France (Ohio State University, Columbus 10, Ohio).***

The reactions of the halogens iodine chloride and bromine with vulcanized rubber and GR-S under conditions similar to those commonly employed for iodine number determination have been studied in considerable detail and compared with the analogous reactions with simple sulfur compounds, including alkyl, alkyl allyl, and allyl sulfides.

Iodine chloride has been found to undergo a reaction with vulcanizates leading to the formation of hydrogen halide in direct proportion to the sulfur present, while bromine apparently does not. The reaction has been found to be accompanied by selective introduction of chlorine into the molecule, probably due to loss of HI from the ICl addition product together with some substitution.

A comparison of the behavior of simple rubber-sulfur or rubber-sulfur-organic accelerator vulcanizates with that of typical sulfides leads to strong support of the alkyl allyl type sulfide in these vulcanizates. The loss of unsaturation which accompanies vulcanization, either in the presence or absence of organic accelerators, corresponds to one double bond per sulfur atom. The presence of zinc, with or without organic accelerators, effects a type of vulcanization with less loss of unsaturation.

The results are consistent with primary α-methylenic attack by sulfur as proposed by Farmer.

(EDITOR'S NOTE: The work for the above report was done on the Firestone Tire & Rubber Co. Ohio State Research Foundation Project in the Department of Chemistry, Ohio State University.)

11:45 A. M.—The Sulfur Bond in Vulcanizates. II. Mineral Sulfide as an Index of Disulfide Cross-Bonding. *S. R. Olsen (Irrigation Branch Experiment Station, Department of Agriculture, Prosser, Wash.), and C. M. Hull and W. G. France (Ohio State University, Columbus 10, Ohio).*

The reactions proposed by Armstrong, Little and Doak, to explain sulfur vulcanization in the presence of metal soap have been investigated under vulcanizing conditions in polyprene and simpler systems by measuring the mineral sulfide produced and, in the case of polyprenes, the accompanying modulus.

Dodecyl mercaptan was found to react with sulfur and zinc soap to produce mineral sulfide equivalent to the oxidation of about 90 per cent of the mercaptan to disulfide; with excess mercaptan, substantially quantitative conversion of sulfur or of zinc soap to mineral sulfide can be obtained.

Several simple olefins have been found to react readily with sulfur and zinc soap under vulcanizing conditions. The reaction is catalyzed by MBT. The mineral sulfide formed is believed to result, in the main, from conversion of the olefin to a substituted diallyl disulfide in agreement with a reaction mechanism proposed by Armstrong and coworkers.

The results with natural rubber furnish evidence for a disulfide bond between α-carbon atoms as an important and, in some cases, the principal cross-link.

Experiments with GR-S indicate appreciable, but relatively less, disulfide cross-bonding, possibly due to greater ease of addition of the mercapto group, formed in the primary stage of vulcanization, to a double bond.

(EDITOR'S NOTE: The work for the above report was done on the Firestone Tire & Rubber Co. Ohio State Research Foundation Project in the Department of Chemistry, Ohio State University.)

Thursday Afternoon—April 11

2:00 P. M.—Sulfur Linkage in Vulcanized Rubber. III. The Reaction of Sulfur with 2-Methyl-2-Butene. *Milton L. Selker and A. R. Kemp (Bell Telephone Laboratories, Inc., Murray Hill, N. J.).*

The reaction of 2-methyl-2-butene and sulfur has been studied as a model system for rubber-sulfur vulcanization. Using carefully purified sulfur and olefin the reaction was carried out at 141.6° C. in shaken glass bombs in absence of oxygen. The following conclusions were reached as a result of a study of the reaction rate and products:

1. The color changes with reaction time; yellow, orange, red, black, parallel those of rubber-sulfur stocks.
2. Rate of combination of the sulfur is directly proportional to reaction time as is the case in rubber-sulfur vulcanization.
3. The absolute reaction rate of 2-methyl-2-butene with sulfur is twice that of pale crepe with sulfur.
4. Olefin combination rate is not directly proportional to time.
5. Starting with equal molar quantities of olefin and sulfur, there is considerable unreacted olefin in the system when 100% of the sulfur has reacted.
6. Hydrogen transfer takes place in the primary reaction resulting in hydrogen-rich liquid products and much smaller yields of solid hydrogen-poor products.
7. The hydrogen-rich compounds are polysulfides R-S_x-R' where x varies from 2 to 6 and either R or R' or both may be alkyl instead of alkenyl.
8. The hydrogen-poor compounds appear to be of the type $C_nH(n + 1)$ S_8 of which $C_5H_6S_8$ and $C_{10}H_{12}S_8$ have been identified. A cyclic acid anhydride in the sulfur system displaying thiono-thial tautomerism has been proposed for the structure of $C_5H_6S_8$.
9. Increased reaction time lowers the average value of x in the polysulfide products R-S_x-R'.
10. The higher the value of x in the polysulfide formula R-S_x-R' the more hydrogen is present.

THE HIGH POLYMER FORUM

Sponsored by the Division of Paint, Varnish and Plastics Chemistry, A.C.S., in cooperation with the Cellulose Chemistry, Colloid Chemistry, Organic Chemistry, Physical and Inorganic Chemistry, and Rubber Chemistry Divisions.

Atlantic City, N. J.
April 9 and 10, 1946

Tuesday Morning—April 9

9:00 A.M.—Symposium on the Physical Chemistry of Copolymers and Copolymerization, arranged by the Division of Physical and Inorganic Chemistry. Introductory remarks by *A. C. Elm and P. J. Flory*.

9:10 A.M.—Disorder in Linear Condensation Copolymer Solids. *W. O. Baker and C. S. Fuller*.

9:50 A.M.—The Relative Activities of Ethylene Derivatives in Copolymerization. *Frank R. Mayo*.

10:30 A.M.—Some Recent Results in the Field of Copolymerization. *Turner Alfrey, Jr.*

11:10 A.M.—Partial Conversion Properties of Copolymers. *Frederick T. Wall*.

Tuesday Afternoon—April 9

2:00 P.M.—Copolymerization of Vinyl Compounds with Dienes. *A. Goldberg, T. Alfrey and W. P. Hohenstein*.

2:25 P.M.—Copolymerization: The Composition-Distribution Curve. *I. Skeist*.

2:55 P.M.—The Viscosity of Dilute Solutions of Long-Chain Molecules. The Initial Concentration Dependence Constant. *M. L. Huggins*.

3:30 P.M.—The Thermal Polymerization of Methyl Metacrylate. *C. Walling and E. R. Briggs*.

4:05 P.M.—The Temperature Dependence of the Osmotic Pressure of Polyvinyl Chloride Solutions. *P. Doty and E. Mishuck*.

4:30 P.M.—A General Theory of Emulsion Polymerization with Respect to Reaction Loci. *W. D. Harkins*.

Wednesday Morning—April 10

9:00 A.M.—The Thermal Polymerization of 2-vinylnaphthalene. *J. M. Grim, W. E. Baldwin and W. H. Hill*.

9:25 A.M.—The X-ray Fine Structure of Synthetic Rubbers. *W. O. Baker and N. R. Pape*.

10:00 A.M.—Elastic N-Substituted Polyamides. *E. L. Wittbecker, R. C. Houtz and W. W. Watkins*.

10:35 A.M.—Chain Transfer in the Polymerization of Styrene. II. The Reaction of Free Radicals with Carbon Tetrachloride. *R. A. Gregg and F. R. Mayo*.

11:10 A.M.—Structural-Chemical Investigations of Rubbers by Stress Relaxation. *R. D. Andrews and A. V. Tobolsky*.

11:35 A.M.—Degradation of Vinyl Polymers. *R. B. Mesrobian and A. V. Tobolsky*.

2:25 P. M.—Balancing the Vulcanization of GR-S and Natural Rubber in GR-S Rubber Mixtures. *A. P. Stubbs (Raybestos-Manhattan, Inc., Passaic, N. J.) and C. R. Johnson (Ridbo Laboratories, Inc., Paterson, N. J.).*

The supply of natural rubber for the next several years, together with certain technical advantages, will lead to the use of mixtures of natural rubber and GR-S synthetic rubber in tires and many other rubber products.

It is recognized that GR-S synthetic rubber requires higher dosage of accelerators than natural rubber to produce the same

degree of vulcanization. This raises the question as to what will happen when mixtures of GR-S and natural rubber are vulcanized. Data presented in this paper indicates that the natural rubber preferentially reacts with the vulcanizing agents so that the natural rubber component is overvulcanized and the GR-S component is undervulcanized. Two thiazole stocks, one all natural rubber, the other all GR-S, were formulated to give equal modulus at a given elongation. When these two formulas were combined in one mix, the modulus increased more than 50%.

By the use of a suitable accelerator activator with the thiazole, it is shown that this increase in modulus of mixtures can be considerably reduced or eliminated, which points to the conclusion that the two elastomer components are more nearly equally vulcanized. With the known tendency of natural rubber vulcanizates to revert on overcure, a method to balance the vulcanization of mixtures should have technical value.

2:40 P.M.—Effect of Variable Black and Softener Quantities Upon the Physical Properties of a GR-S Compound. ***L. R. Sperberg, L. A. Bliss, and J. F. Svetlik (Phillips Petroleum Co., Bartlesville, Okla.).***

The object of this work was to investigate rather thoroughly a variable Philblack A softener system as a sulfur level of 1.75 parts per hundred parts of rubber and using a curing temperature of 280° F. In order to effectively cover the range, a series of sixteen compounds was prepared wherein the black and softener loading were systematically varied. The black loadings investigated were 30, 50, 70 and 90 parts per hundred parts of rubber and the softener loadings were varied according to the black loading and comprised 0, 12½, 25, and 50 per cent of the black loading.

Comparative data are plotted into a series of useful compounding curves using the black and softener variable as the X and Y axes respectively. A family of equal value curves for several of the major properties are portrayed from which it is possible to select the best black-softener combination to use for certain applications where the specific properties desired have been previously specified.

3:00 P.M.—Mechanical Processing of Carbon Blacks and Resultant Effects in GR-S Compounds. ***R. E. Dobbin and R. P. Rossman (Godfrey L. Cabot, Inc., Boston, Mass.).***

It is desirable to pelletize or densify carbon black to facilitate its industrial use. Recent experiments in conjunction with development work toward improved furnace black pellets have shown that significant changes can occur in analytical properties of carbon black, as its density is increased by mechanical work. Corresponding changes can be noted in the properties of GR-S stocks compounded with carbon black samples of increasing density.

Samples of carbon blacks have been subjected to increasing amounts of mechanical action. A substantial increase in the DPG adsorption, a slight increase in surface area, lower pH values, and a change in composition of the volatile content of the carbon black, are a result of this mechanical work. Heats of adsorption measurements for nitrogen on these samples show no significant change.

Similarly, when this series of carbon black samples of increasing density is milled into GR-S, the following progressive changes in properties of the compounded stock can be observed: (a) A progressive decrease in the relative smoothness of roll mill sheeted stock, and a corresponding increase in stock shrinkage; (b) A progressive decrease in the modulus of cured stock; (c) A progressive decrease in the electrical conductance of the cured stock.

The experimental data suggests that the densification of carbon black by mechanical action can change the mode of dispersion of carbon black in rubber media. Evidence exists to show that the surface of the carbon black particle has been fundamentally altered. Significant, however, is the fact that smoothness, modulus and electrical conductivity of carbon black-GR-S stocks can be seriously altered in the densifying or pelletizing processes.

3:15 P. M.—Butyl Inner Tubes: Performance and Effect on Tire Life. ***I. E. Lightbown and L. S. Verde (Stanco Distributors, Inc., New York, N. Y.) and J. R. Brown, Jr. (Standard Oil Development Co., Elizabeth, N. J.).***

Over-the-road tests being run at San Antonio, Texas, on Stanco Test Cars using passenger size tires under conditions of ten per cent overload and operating at sixty miles per hour, twenty-four hours per day, five days per week reveal the following fact: Butyl inner tubes are approximately eight times better than natural rubber tubes in their "air holding" capacity under these severe test conditions.

Because of this property of Butyl inner tubes new test procedures have been developed, making it possible to study the effect of maintenance of proper inflation pressure on tire performance. These new test procedures are discussed. Test results indicate that the maintenance of proper inflation pressure, afforded by Butyl tubes because of their superior air retention, will result, under these severe test conditions, in an increase in tread life of approximately ten per cent. Results have been obtained at both sixty miles per hour and forty miles per hour.

The "growth" of Butyl vs. Natural Rubber tubes in service has been studied and is discussed. The superior retention of physical properties of Butyl compared with natural rubber under severe laboratory aging conditions has been translated to service aging in actual over-the-road performance. Road tests indicate that the superior retention of properties on aging of Butyl yields an inner tube exhibiting increased puncture and "blow-out" resistance.

3:35 P. M.—Styrene-Diene Resins in Rubber Compounding. ***A. M. Borders, R. D. Juve, and L. D. Hess (Goodyear Tire & Rubber Co., Akron, Ohio).***

The chemical and physical properties of Pliolite S-3, one of several resinous copolymers of styrene with butadiene, are described. This resin is compatible with natural and several synthetic rubbers. As a reinforcing resin in mixtures with rubber it is valuable for improvement of smoothness on extrusion or calendering and for reduction of shrinkage. Methods of mixing various rubbers with the styrene-diene resin are described. Compounding procedures for rubber-resin mixtures are briefly described. Extensive data are tabulated, illustrating the effect of Pliolite S-3 in both GR-S and natural rubber compounds upon hardness, stiffness, extrudability, tensile strength and impact resistance.

Although the resin is brittle at room temperatures, in mixtures with rubber (up to 50/50) it does not greatly raise the brittle point or increase the rate at which the mixture stiffens with reduction in temperature. Brittle points and temperature-moduli data are plotted to illustrate this behavior. Electrical properties and moisture absorption values of the resin are reported, indicating its usefulness in mixtures with low water absorption rubbers as electrical insulation. The ability of Pliolite S-3 to impart increased hardness and rigidity to rubber compounds with retention of considerable resilience has prompted its use in rubber and synthetic rubber footwear. Other applications of Pliolite S-3 are indicated in which advantages to the use of cyclized natural rubber appear.

Friday Morning—April 12

9:00 A. M.—Plasticizing GR-S and Natural Rubber. ***Arnold R. Davis (American Cyanamid Co., New York, N. Y.).***

Some organic accelerators, such as DPG and Pip-Pip under some conditions, as well as some antioxidants, have been known to have pronounced softening or plasticizing effects on rubber. Oxygen has been shown to be largely responsible for the softening or plasticizing of rubber during milling. It undoubtedly plays a major part in the hot oven softening of rubber and synthetic rubber of the butadiene-styrene copolymer type. The hydrazines and thiophenols or aromatic mercaptans and some of their derivatives are known to be plasticizers or peptizers for rubber. Certain aromatic mercaptans or their zinc salts and nitrosophenolic type of chemicals, with hot milling, have been used to plasticize GR-S.

Another class of chemicals, namely the di(o-acylamidophenyl) disulfides, has been found to plasticize GR-S during hot milling. The most active of the class, di(o-benzamidophenyl) disulfide or o,o'-dibenzamidodiphenyldisulfide is effective above 240° F. (116° C.) in both GR-S and natural rubber. o,o'-dibenzamidodiphenyldisulfide has practically no odor, is non-toxic and does not discolor white or light colored stocks. Data are given to illustrate its effects on the plasticity of GR-S and natural rubber, as well as the effects on the cured physical properties of typical stocks. Its effect on GR-S gel build-up in hot processing is also shown. Possible uses to increase production capacity and improve processing are outlined.

9:15 A. M.—High Solids Synthetic Latex Directly From the Reactor. ***F. D. Chittenden, C. D. McCleary, and H. S. Smith (Naugatuck Chemical Division, U. S. Rubber Co., Naugatuck, Conn.).***

In pre-war days consumers were accustomed to receive natural latex as a concentrate of 62-65% T.S. obtained from the 38% solids latex produced by the tree. Concentrated latices have the advantage of lower shipping costs, more rapid drying rates, thicker films from each dip and less shrinkage and cracking of film. Until recently butadiene-styrene type high-solids latices also have been obtainable only by concentration of dilute latices. Relatively expensive and time-consuming processes involving considerable investment in equipment are required for such concentration.

It is now possible to produce stable, fluid latices of 55-60% T.S. directly in the reactor. The average particle size of these latices (over 2000 Å average diameter) approaches that of natural latex. The mechanical stability is markedly superior to that of natural latex. Laboratory tests indicate that films from these latices are equivalent to those from creams of Type III in film tensiles, low temperature properties and ease of handling.

Several difficulties, unique to high-solids polymerizations, have been encountered and overcome. Although all latices exhibit a slight viscosity peak during polymerization, this phenomenon is marked for low water formulations, which tend to gel solidly at about 20% total solids. This has been overcome by special agitation, increased reaction cycle and careful balance of emulsifiers, stabilizers, and viscosity reducing agents. The increased monomer loading of the reactor leads to correspondingly greater heat evaluation at any given time, which is greater than can be removed by normal jacket cooling. This has necessitated longer reaction cycles and installation of reflux condensers which constantly condense vaporized butadiene and return it to the system. Reaction rates can be varied within wide limits by regulating the balance between emulsifiers and stabilizers. Careful control of this balance is necessary to maintain latex stability. This stabilizer balance also exerts a marked effect on the quality of laid films, apparently through their effect on yield point.

High solids latices are fundamentally more foamy than dilute latices, making stripping of residual monomers extremely difficult on a plant scale. To reduce residual monomers, conversion has been carried practically to completion by adding a "booster" solution late in the reaction at the point where the rate of reaction normally falls off sharply. This "booster" consists of additional modifier, catalyst and stabilizer.

Up to the present time it has been necessary for the consumer to pay considerable premium for concentrated latices. These successful developments of high solids latices produced in the reactor will practically eliminate this premium, and furnish a material equal in quality to creamed latices.

9:35 A. M.—Continuous Process Preparation of GR-S Masterbatches with Non-Black Pigment. ***E. L. Borg, J. C. Madigan, R. L. Provost, and R. E. Meeker (U. S. Rubber Co., Institute, W. Va.).***

The use of GR-S type synthetic rubbers in products requiring reinforcement with pigments other than carbon black is extensive. Aqueous dispersion of these pigments and subsequent co-precipitation with rubber from mixtures in latex has proved to be desirable in cases where dry mixing of the pigment in GR-S is difficult or where optimum degree of dispersion with subsequent quality improvement is best obtained through incorporation in the liquid phase.

Experimental work leading to the successful preparation of GR-S latex masterbatches is reviewed. Some of the variables affecting the process are: the type of pigment and its concentration in the water dispersion to be mixed with the GR-S latex, the solids content of the latex, the type of emulsifier in the latex, the nature and concentration of the coagulant and stabilizer, the coagulation temperature, and the mechanical treatment of the co-precipitate during and subsequent to coagulation. All of these variables must be carefully controlled since they influence pigment dispersion and retention and coagulum characteristics. The latter must be made adaptable to existing washing and drying facilities.

Equipment and methods are described by which the more common non-black pigments, especially clays and calcium silicates, may be incorporated into GR-S in a continuous process through the medium of aqueous dispersion and subsequent co-precipitation.

Large scale plant preparation of a non-discoloring GR-S clay masterbatch is discussed. Physical properties, processing characteristics, and uniformity of clay loading are given.

10:00 A. M.—The Effect of pH on the Physical Properties of Films from Synthetic Latices. ***R. H. Walsh and I. W. Dobratz (Rubber Chemicals Div., E. I. du Pont de Nemours & Co., Wilmington, Del.).***

The control of the pH of rubber latex compounds has long been realized to be of utmost importance in producing compounds with good mechanical stability. Jordan has adequately defined the mechanism of pH compounding of rubber latex with the so-called "KOH Number." The system is, however, not applicable to synthetic latices where, due to the lack of natural proteins and, therefore ammonia stabilization, zinc oxide can be used as a compounding ingredient without adversely affecting stability.

Although "KOH Number" compounding does not apply to synthetic latices, proper control of the pH of neoprene and GR-S compounds greatly affect the physical properties of their films and their dipping qualities. Experimental work indicates that films prepared from neoprene and GR-S compounds whose pH is adjusted into the range 10.0 to 10.8, exhibit maximum tensile strength and modulus and minimum swell in water, compared with those prepared from other compounds at higher or lower pH's.

Polarographic analysis of the serum from compounds whose pH had been varied 9.0 to 13.0 was studied, together with the effect of pH on zinc in solution. It can be shown that the increase in physical properties can be correlated with the changes in the nature of the zinc complexes in aqueous solution. It was found that zinc can exist in at least three distinct forms between pH 6.0 and 12.

10:15 A. M.—The Creaming of Neoprene Latex. ***H. K. Livingston (Jackson Laboratory, E. I. du Pont de Nemours & Co., Wilmington, Del.).***

Neoprene latex that has been mixed with solutions of certain hydrophilic colloids spontaneously separates into two layers on standing. The lower layer contains the greater concentration of neoprene, but in other respects the process is comparable to the creaming of natural rubber latex or of milk, and has been termed "creaming" for this reason.

The creaming of neoprene latex can also be produced by the action of electric fields or by cooling. It appears that there is some factor of fundamental importance which is associated with all three methods of producing creaming. It is postulated that in every case the viscosity must be increased until within a certain critical range for creaming to take place. This small increase in viscosity will retard Brownian motion so that clustering can occur. If the viscosity is too low, clusters do not form; if it is too great, separation is prevented.

Data are presented to show that the viscosity of neoprene latex-hydrophilic colloid mixtures can be correlated with the creaming behavior of the mixtures.

10:30 A. M.—Alkyl Phenol Resins as Tackifiers for GR-S. *G. E. P. Smith, Jr., and J. C. Ambelang (Firestone Tire & Rubber Co., Akron, Ohio).*

Tack is understood in this discussion to mean the tendency of two surfaces of a substance to adhere when brought together with slight force. This property is utilized in fabricating rubber goods. While natural rubber, when properly handled, possesses a high degree of tack, GR-S polymer is almost completely non-tacky and various materials have been added to impart tack to the compound. The most effective tackifiers appear to be condensation products of *p*-alkyl phenols with acetylene, aldehydes or sulfur dichloride.

The sulfide type was the first one studied in this laboratory. Certain representatives of this type were found to be effective when used with zinc rosinate or related materials. A number of resins were made from various alkyl phenols with varying molecular ratios of sulfur dichloride and sulfur monochloride. Only sulfur dichloride was found to be satisfactory and only *p*-alkyl phenols, in which the alkyl group was butyl or higher. From these observations with the aid of Fisher-Hirschfelder atomic models, the tackifier molecule is pictured as a crumpled, fairly rigid chain of alkyl phenol residues with the hydroxyl groups on one side of the molecule.

The same generalizations apply to the alkyl phenol-aldehyde resins though as a class they are more effective and the addition of zinc rosinate is not required.

With the assumption that the *p*-alkyl phenol-aldehyde resins are linear polycondensation products, the chain length, as indicated by intrinsic viscosity, appears to correlate with tackifying properties through a certain range. The alkyl phenol sulfides have lower intrinsic viscosities and are less active tackifiers.

10:55 A. M.—Chemical Derivatives of Synthetic Rubbers. *J. D. D'Ianni, F. J. Naples, J. W. Marsh, and J. L. Zarney (Goodyear Tire & Rubber Co., Akron, Ohio).*

Drastic restriction of the commercial use of natural rubber during the war for chemical derivatives such as the chlorinated, hydrochlorinated and cyclized products prompted the study of synthetic rubbers for this purpose. It was found that polyisoprene and other isoprene-containing synthetic rubbers behaved chemically very much like natural rubber, because of the similarity in structure, whereas GR-S and other butadiene-containing synthetic rubbers were either non-reactive or showed a different behavior.

A process for chlorinating emulsion polyisoprene was developed which gave a product very similar to chlorinated natural rubber with respect to chlorine content, viscosity, thermal stability, solubility and general utility in protective coatings and rubber to metal adhesives. GR-S, however, could not be satisfactorily chlorinated under the same conditions.

A process for cyclizing emulsion polyisoprene in almost exactly the same way as previously used for natural rubbers was developed to give a product which for most applications was equivalent to cyclized natural rubber. Under the same conditions, GR-S was completely unaffected. Work was also done in converting monomeric isoprene or isoprene/styrene systems directly into a resinous product with a stannic chloride or boron fluoride catalyst in an attempt to duplicate cyclized isoprene polymers.

Emulsion polyisoprene hydrochlorinates readily in a manner very similar to natural rubber. Whereas rubber hydrochloride is an excellent film-forming material, polyisoprene hydrochloride is too weak and rubber-like to be of interest for this purpose although it has other interesting properties, such as low moisture vapor transmission. GR-S adds hydrogen chloride very slowly, if at all.

In conclusion, synthetic polyisoprene shows a striking similarity to natural rubber in chemical behavior, whereas GR-S is either non-reactive or reacts with difficulty.

11:20 A. M.—Fundamental Studies on the Oxidation of GR-S and Other Elastomers. *John O. Cole and James E. Field (Goodyear Tire & Rubber Co., Akron, Ohio).*

The effect of air oxidation at 100°C. on the following uncured emulsion polymers has been studied: polyisoprene, polybutadiene, isoprene-styrene and butadiene-styrene. Based on changes in benzene solubility and intrinsic viscosity the net effect of oxidation of isoprene polymers was degradation or chain scission similar to that occurring with uncured natural crepe rubber, while with butadiene polymers further polymerization or cross linking predominated.

Changes in benzene solubility, intrinsic viscosity, swelling index and iodine number which occurred during air oxidation of the uncured GR-S hydrocarbon are reported. Oxidation of GR-S in the absence of antioxidant results in the rapid formation of a highly brittle, cross-linked polymer. Data are presented to show that oxidation in the presence of an antioxidant may cause appreciable chain scission in GR-S. Oxygen uptake and antioxidant consumption during aging of GR-S have been measured by direct analytical methods. Air oxidation of GR-S containing phenyl B-naphthylamine caused a marked decrease in the secondary amine content of the acetone extract. Appreciable quantities of the antioxidant appear to combine with the polymer during aging.

Changes which occur in the infrared absorption spectra of unsaturated polymers during oxidation are reported. This technique presents a new method for studying the mechanism of oxidation of polymeric materials. The present theories of the mechanism of oxidation of unsaturated polymers are reviewed and the infrared absorption spectra data are interpreted in terms of these theories. A possible mechanism of antioxidant action is suggested.

Friday Afternoon—April 12

2:00 P. M.—The Role of Carbon in the Oxidation of GR-S Vulcanizates. *Hugh Winn (Firestone Tire & Rubber Co., Akron, Ohio), and J. Reid Shelton and David Turnbull (Case School of Applied Science, Cleveland, Ohio).*

Carbon black is shown to be a catalyst for the oxidation of GR-S vulcanizates. The increased rate of oxygen absorption with higher loading is shown to be caused by the increase in carbon surface area. Furthermore, the increased oxygen absorption is shown to cause a correspondingly greater deterioration of physical properties. The relative activity of a unit of surface varies with the type of carbon, and furnace carbons are shown to be only 55% as active as channel blacks in promoting oxidation. A theoretically derived equation is presented which correlates oxygen absorption with surface area and loading.

2:15 P. M.—Crack Growth in GR-S Treads: Its Relation to State of Cure and Composition. *A. E. Juve (B. F. Goodrich Co., Akron, Ohio).*

Two of the most serious troubles encountered with GR-S in tire use are excessively rapid crack growth and high heat build-up in the tread composition. One characteristic may be improved at the expense of the other by variations which affect the state of cure. The relationship between the two for a simple composition containing the normal loading of EPC or MPC black was found to be:

$$\text{Log Flex} = .0126\ \Delta T + 4.28$$

for a specific set of conditions for measuring heat rise and crack growth. For other variations in composition which do not involve other carbon blacks the relationship was found to be:

$$\text{Log Flex} = 5.42 + \frac{\Delta T}{336} - \frac{M}{2000}$$

where M is the 300% static modulus.

A knowledge of these relations permits the ready evaluation of experimental polymers or suggested compounding modifications which are intended to provide a more favorable balance between these properties.

2:30 P. M.—Dynamic Surface Cracking of GR-S Vulcanizates in Ultra-Violet Light. *M. C. Throdahl (Monsanto Chemical Co., Nitro, W. Va.).*

A dynamic flexing device for studying the cracking characteristics of GR-S vulcanizates is shown and described. Speci-

mens cracking during dynamic flexing while exposed to ultra-violet light illustrate the effectiveness of certain organic compounds in minimizing this deficiency of GR-S vulcanizates.

The flexing mechanism is based on the premise that a constantly changing surface film increases the probability of formation of cracks and increases the rate of growth of those already formed. A double turntable fixed to a double cam provides angular motion which insures uniformity of radiation and also causes linear displacement, which is necessary to stretch the surface of the specimens. Ordinary dumbell tensile specimens are stretched over specially designed rods arranged concentrically near the outer diameter of the turntable.

It was observed that 0.25 to 1.0% concentrations of certain ketone-amine condensations minimized greatly the tendency to crack at the surface. Correlation of results of exposure to summer sunshine with exposure to the artifically generated ultra-violet light is shown.

2:50 P. M.—A New Accelerated Weathering Test for Rubber. ***J. Crabtree and A. R. Kemp (Bell Telephone Laboratories, Murray Hill, N. J.).***

It has recently been established that the major agencies responsible for the deterioration of rubber on outdoor exposure are two in number; *viz.*, a light-energized oxidation by the oxygen and a multiple cracking of the rubber by the ozone of the atmosphere, the latter occurring only when the material is under tension. The over-all result in any one location depends on the relative preponderance of these two factors. Light colored goods are more likely to suffer from the former than rubber protected from light by incorporation of carbon black such as cable jackets, hose and the like. Accelerated tests for weathering of rubbers therefore logically call for separation into two distinct procedures, one for susceptibility to light-energized oxidation, the other for liability to cracking by the ozone in the atmosphere.

Based on extensive studies of deterioration of rubber by weathering these effects are discussed and conditions for an accelerated test for susceptibility to atmospheric ozone cracking are proposed. The method of generating an atmosphere of dilute ozone of the required constant concentration is described along with the device employed in the exposure of the specimens. A rapid method of estimation of the ozone content of atmospheres of very low concentration on which the test depends is also described and comparative data on natural rubber and GR-S compounds are given.

3:05 P. M.—Measuring the State of Cure of Neoprene Vulcanizates. ***Don B. Forman and R. R. Radcliff (Rubber Chemicals Div., E. I. du Pont de Nemours & Co., Wilmington, Del.).***

Gibbons, Gerke and Tingey (*Industrial Engineering Chemistry, Analytical Edition*, Vol. 5, p. 279, 1933) showed that the state of cure of natural rubber vulcanizates could be measured from the rate of recovery of "racked" samples. The state of cure of neoprene vulcanizates can also be determined by the same test. Higher states of cure are indicated by increasing rates of retraction with respect to temperature. The T-50 test apparatus is used to obtain necessary data.

This test can be used for production control in the manufacture of neoprene items. Retraction-temperature curves constructed from the data on these tests are indicative of the possibilities of crystallization of neoprene vulcanizates during long exposures to moderately low temperatures. More precise measurements of the effects of compounding ingredients on the curing characteristics of neoprene compounds can be made. The test should be particularly useful in classifying the accelerating and retarding tendencies of plasticizers.

3:20 P. M.—Quantitative Determination of Inhibitors in Polymers by Ultra-Violet Light Absorption. ***L. T. Eby and F. W. Banes (Standard Oil Development Co., Elizabeth, N. J.).***

The determination of N-phenyl-2-naphthylamine in polymers, such as Butyl rubber, GR-S and Perbunan, is made by dissolving the polymers in suitable solvents and measuring the ultra-violet absorption of these polymer solutions. Isooctane is the preferred solvent for Butyl rubber while ethylene dichloride is preferred for the Buna-type polymers. The optical density of the solutions of known polymer content are measured at three wavelengths, *i.e.*, at wavelengths of a maximum absorption (λ_{max}) and two adjacent minima absorptions (λ_{min}, λ'_{min}). This permits correcting for linear "background" absorption without actual measurement thereof for all materials other than the inhibitor. The relation is of the form:

$$\% \text{ inhibitor} = \frac{100\ (D^{max} - (1-n)\ D^{min} - nD'^{min})}{C\ (K_i^{max} - (1-n)\ K_i^{min} - nK_i'^{min})}$$

Where D^{max}, D^{min} and D'^{min} are the optical densities of a solution containing C grams of polymer per liter of solvent at wavelengths giving the type of absorption designated above. The K_i's are the specific extinction coefficients of the inhibitor at these same wavelengths. The coefficient n is dependent upon the wavelengths as follows:

$$n = \frac{\lambda_{min} - \lambda_{max}}{\lambda_{min} - \lambda'_{min}}$$

This type of background correction is especially beneficial in analyzing the inhibitor content of polymers which have been subjected to oxidizing conditions for long periods of time, otherwise a measurement of the optical density of the polymer solution at maximum absorption is often adequate to permit a close approximation of the inhibitor content of the polymer.

The method is rapid and accurate and may be extended to materials of antioxidant nature other than N-phenyl-2-naphthylamine.

3:35 P. M.—Heats of Adsorption on Carbon Blacks. ***R. A. Beebe and J. Biscoe (Amherst College, Amherst, Mass.) and W. R. Smith and C. B. Wendell (Godfrey L. Cabot, Inc., Boston, Mass.).***

While certain rubber reinforcing properties of carbon black can be interpreted in terms of particle size, others, notably increase of modulus, cannot be adequately described on this basis. It has often been suggested that the specific activity of the carbon black surface must play a significant role in reinforcement. However, experimental confirmation of this point of view has been extremely meager. A comprehensive investigation of the surface activity of a number of carbon blacks of varying reinforcing ability has been undertaken. The present paper describes some of the preliminary results of this investigation.

The differential heats of adsorption measured at 195°C. for nitrogen, oxygen and argon on four carbon black samples have been determined as a function of amount of gas adsorbed. The first increments of all adsorbates are adsorbed on reinforcing channel black with a heat of approximately 4400 calories per mol. This value decreases to 2300 calories at a volume of adsorbed gas corresponding to 0.8 to 1.0 monolayers as calculated from the Brunauer, Emmett and Teller theory. After this point the heat values drop sharply and approach the heat of liquefaction of the adsorbate. Removal of the chemisorbed oxygen and hydrogen from the carbon black surface does not affect these values. Heat treatment sufficient to bring about partial "graphitization" of the channel black does not appreciably alter the total extent of surface but does markedly alter the nature of the surface as evidenced by the absence of high initial heat values such as were obtained with the reinforcing carbons.

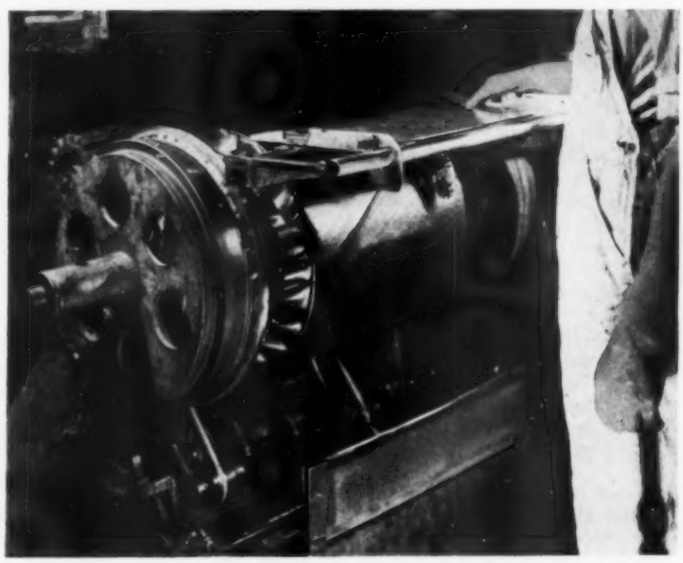
Semi-reinforcing furnace blacks give heats of adsorption intermediate between those obtained with the channel black and the "graphitized" black.

Measurements are being extended to include saturated and unsaturated hydrocarbons as adsorbates. Preliminary values with butane and butene-1 at 0°C. show a similar dependence on fraction of carbon black surface covered. No specific effect of the olefinic linkage has been observed as yet.

Goodyear's Tire Machine

ILLUSTRATED on these pages is the semi-automatic tire building machinery, which was installed by the Goodyear Tire & Rubber Co. just before the war, and used for the manufacture of popular sizes of passenger tires. The tire builder feeds materials into the machine and starts its automatic operation, activated by an intricate assortment of photo-electric and electronics devices that cause the machine to produce tires of uniform construction.

LEFT: Initial step in the manufacture of 6.00-16 passenger car tires shows the tire builder placing the inside bead over the collapsed drum.

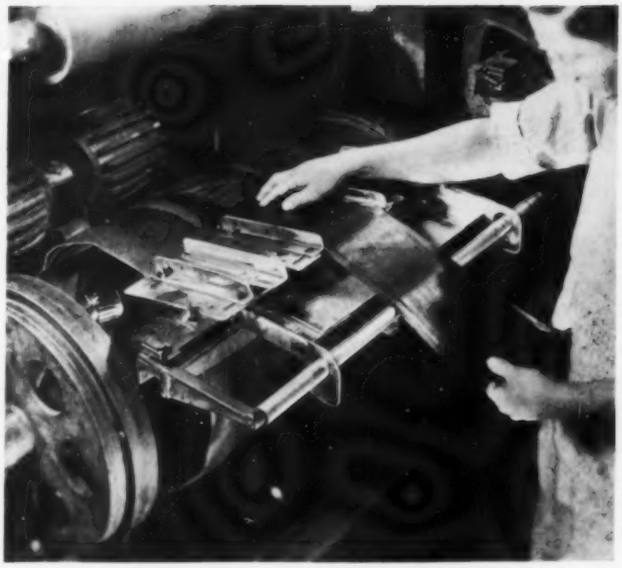


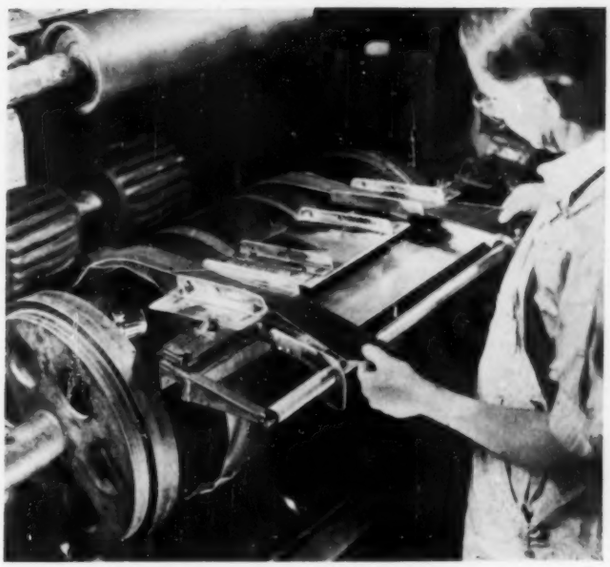
UPPER LEFT: Here the first of the four plies is started on the drum, guided by the builder as the drum rotates.

UPPER RIGHT: In this view, the first and second plies are being swabbed by the machine preparatory to setting of the beads.

LEFT: After the bead setters have been moved out of the way, the automatic stitchers of the tire machine turn up the first and second plies.

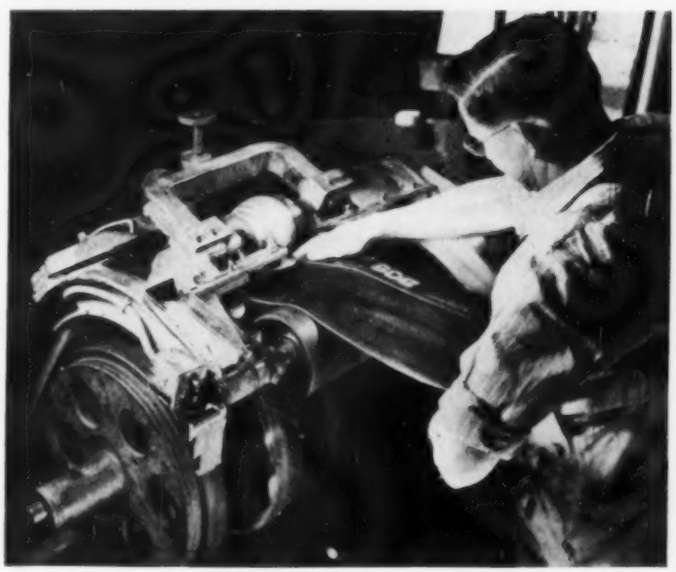
RIGHT: The turn up of the first and second plies completed, the stitchers move back into neutral position, as indicated, and the first and second plies and beads are securely wrapped.





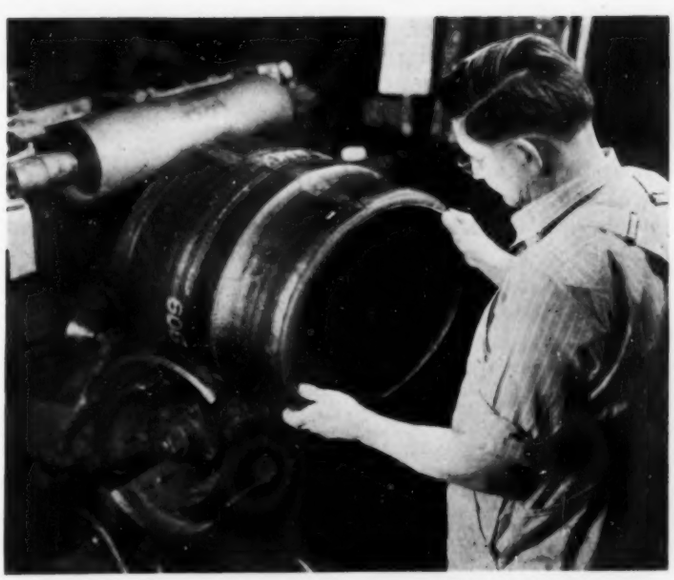
UPPER LEFT: Here the breaker is being applied over the center of the plies.

UPPER RIGHT: This view shows the chafers being applied. The strips serve to prevent the bead of the finished tire from chafing on the rim.



ABOVE: In this illustration, the operator is starting to apply tread on which the design will appear when the tire has been bagged and cured. The machine's tread roller assists in this operation.

RIGHT: Here the finished tire has been taken from the collapsed drum. After a quick inspection by the builder, the tire is conveyed to the inspection station via overhead conveyor.



Editorials . . . . . .

The Impending Batt Report

THE report of the Inter-Agency Policy Committee on Rubber, headed by William L. Batt, former vice-chairman of the War Production Board, as chairman, will be made in the next few days. It is expected to recommend maintenance of synthetic rubber production in peacetime at an annual level of 250,000 tons, maximum production of synthetic rubber through 1947, establishment of a permanent "Rubber Office" along the lines and with the power of the former Office of the Rubber Director, establishment of a permanent inter-agency committee to formulate policy, development of a peacetime stockpile of natural rubber to be maintained between 150,000 and 200,000 tons, continued domestic and international allocation of natural rubber, and continued gradual relaxation of regulations to permit increasing amounts of natural rubber in end-products consistent with imports.

It is evident from the tone of forthcoming recommendations that the Batt Committee is far more concerned with the long range than the short term. It is also evident that the committee is in full agreement on a policy which would employ sufficient means to avoid another national rubber shortage no matter how long another "national emergency" would last. Experience is still the world's best teacher, and the United States went through too many uncomfortable periods during the war years, when available supplies touched the danger point, to ever again lean solely on foreign sources for its rubber.

The recommendation to be made for the production of at least 250,000 tons of synthetic rubber in peacetime years is consistent with the theory which has been urged by leading American rubber authorities. For the next several long years to come this production figure will vary, dependent on incoming supplies of natural rubber. For example, the actual amount of natural rubber which will be secured annually from the Far East for the next few years is extremely doubtful. Some 300,000 tons of such rubber is expected to be secured by the United States, but some reliable quarters estimate that less than 250,000 tons will actually come in. Even if the total amount is secured, it will practically exhaust existing stockpiles in the producing areas and although production has begun again in a small way allocations to the United States by the Combined Rubber Committee will probably mean a supply of no more than 400,000 tons in 1947.

The report is also expected to recommend continued government sponsorship of synthetic rubber research, and on this score the industry seems to be somewhat divided. There are those who believe that all research on synthetic rubber should be pooled to avoid overlapping with accompanying waste of time, money and effort, and others who believe that the fruits of competitive research will more than offset any waste occurred. This is a moot problem, and the answer will probably be a cooperative program of some type, with reservations concerning individual enterprise. Such conclusive progress has been made in the government's over-all research program, that it would represent an industrial crime to disband the units which now work in such close harmony.

Another recommendation to be made, that of establishment of a separate "Rubber Office" with powers to continue controls now administered by the Civilian Production Administration, meets with the approval of the rubber manufacturing industry. It may sound paradoxical that whereas most industries are fighting against continued government control, the rubber manufacturing industry welcomes such control. The point is that the industry recognizes the fact that its supply of rubber is dependent on numerous factors, including international complications, and if chaos is to be avoided controls must be continued for several years at least and certainly longer than the life of the Second War Powers Act, which expires next June. It does not relish control, but accepts it as a stabilizing factor.

An interesting comment on the attitude of the rubber manufacturing industry with regard to continued government control was expressed in an excellent article on the over-all rubber situation published in the March issue of Fortune Magazine under the title of "Reversal in Rubber." It referred to the situation as "enforced collaboration that might have both good and bad results" and pointed out that "it is hard to work out rules of the game." The major danger of such cooperation, according to the article, is the possibility that the profit motive will lose ground and "may be lost sight of." On that score the industry has little fear.

CURRENT NEWS OF THE MONTH

LATEST REVISION OF RUBBER ORDER BANS NATURAL RUBBER FOR EXPERIMENTAL CEMENT

CONSIDERABLE activity on various phases of the over-all rubber problem has occurred in the past few weeks. Revisions to Rubber Order R-1 and Appendix I of that order were announced, with a revision of Appendix II pending. The price of GR-I (Butyl) was increased. Authorization to resume the production of butadiene from industrial alcohol was given to the Carbide & Carbon Chemicals Corp. A report on the production of passenger car and motorcycle tires in 1945 was issued. Changes were made in the price regulation covering cotton textiles which may result in an easing of the shortage faced by the rubber and other industries. An encouraging report on the natural rubber situation in the Far East was received. And several amendments to price regulations covering various types of rubber products were announced.

The latest amended rubber order, officially known as Rubber Order R-1, as Amended March 1, 1946, which includes Appendix I, bans the use of natural rubber or natural rubber latex for experimental manufacture of rubber cements. Two reasons are said to have prompted this action, first, that the techniques used in the production of natural rubber cements have been well known for many years thus obviating the need for further experimentation on an extensive basis, and second, and more to the point, some rubber allocated in small amounts for experimental purposes was finding its way into black market production of commercial type rubber cement. Small amounts of natural rubber and natural rubber latex had been allowed for experimental purposes in cements since September 27, 1945.

Other Provisions of Order

The latest amended rubber order contained several additional provisions, including the following:

1. Products resulting from the experimental use of natural rubber or latex cannot be sold.

2. Limited amounts of natural rubber are made available to manufacturers of new shoes for production of shoe cement for which synthetic rubber had proved unsatisfactory in certain operations. CPA will issue certificates to all shoe manufacturers covered by Order M-217 which will specify the permitted quarterly consumption of rubber for shoe cement. Allocations will be based on the individual shoe manufacturer's production during October, 1945. The certificates must be attached to CPA Form 3662 and sent to the Rubber Division by the actual manufacturer of the cement before authorization to use the natural rubber will be issued. Use of natural rubber in shoe cement for the manufacture of new shoes has been prohibited since January 1, 1944.

3. Several typographical errors in the order as previously printed are corrected and an omission in code 22-D of Appendix I is included in the amended order. The added words in this section are "and oxygen breathing apparatus."

Incidentally, a revision of Appendix II of the rubber order is pending at this writing (March 12). This revision will cover specifications for a big jump in natural rubber usage by permitting increased amounts of such rubber in truck and bus tires. The thinking in this regard is that because improved tires will give more service, the number of bus and truck tires needed will not be so great.

Increase Butadiene Facilities

Authorization for the Carbide & Carbon Chemicals Corporation to resume production of butadiene from industrial alcohol at the government-owned butadiene plant located at Institute, West Va., was granted by the Office of Rubber Reserve (RFC) on February 26.

Operations at the Institute plant were suspended by the RFC in November, 1945, and the plant placed in a standby condition. The requirements for synthetic rubber following V-J Day had substantially declined in anticipation of increasing supplies of natural rubber becoming available from the newly liberated Far Eastern producing areas. The Office of Rubber Reserve had, as of that time, substantial inventories of GR-S, which inventories together with the productive capacity of the remaining butadiene facilities were indicated to be adequate to supply all GR-S requirements for the year 1946.

Since last fall, however, substantial revisions in the estimates of natural rubber availability have been made. It is now expected that the United States may receive approximately 250,000 to 300,000 long tons of natural rubber in 1946. This estimate is approximately 100,000 long tons lower than that made during the fall of 1945.

With rubber consumption being maintained at a high level as a result of the rapid reconversion of the rubber manufacturing industry, it is estimated that production requirements for GR-S during 1946 will be in excess of 600,000 long tons. The total capacity of the petroleum-butadiene facilities presently being operated by the Office of Rubber Reserve is equivalent to approximately 550,000 long tons of GR-S, thus indicating a need for some additional butadiene manufacturing capacity.

The Institute plant can produce sufficient butadiene from alcohol for the manufacture of approximately 150,000 long tons per year of GR-S. However, it is not anticipated that it will be necessary to operate this plant at full capacity to meet the present GR-S production schedule. The alcohol to be used as feedstock for this plant will be taken from Government-owned stocks which are presently being held by the RFC.

RFC said that the reopening of the plant will have no effect upon the rate of manufacture of tires, tubes, or other civilian rubber products. There is no present shortage in the supply of synthetic rubber, and the reopening of this plant will merely assure that no shortage will develop in the coming months which might have the effect of reducing the output of critically needed rubber goods.

As a means of averting an impending shortage of monomeric styrene in the United States, Rubber Reserve announced on February 21 that it will make available to private industry such quantities of monomeric styrene as may be produced in excess of the requirements of the government's synthetic rubber program. Sales will be made only in tank car lots at the established market price of 13c per pound, f.o.b. government producing plant nearest the point of delivery. Sales of this type will end as soon as private industry can meet consumer demand.

Raise Price of Butyl

Rubber Reserve also announced on February 26 that effective with Purchase Permits dated March 1, 1946, for delivery during the month of March and thereafter, with the approval of OPA, it will sell GR-I (Butyl) at 18½c per pound and GR-I plant clean-up material at 16.65c per pound, this price being

f.o.b. producing plant, plus the established uniform freight charge in the case of domestic purchases. All purchases of GR-I for export purposes will be sold at 18½c per pound f.o.b. producing plant.

Prior to March 1 and since its availability to the domestic rubber field, GR-I was sold at 15½c per pound and GR-I plant clean-up material at 13.95c per pound, f.o.b. producing plant, plus the uniform freight charge of ½c per pound for purchases in carload lots and 1c per pound for purchases in less than carload lots. The price of GR-I was also recently raised in Canada.

Figures on Tire Production

According to a statement issued by the Rubber Division of the Civilian Production Administration on February 21, production of passenger car and motorcycle tires in 1946 amounted to 28,292,112 units, which was 50% above the 18,899,022 units built in 1944. The bulk of the 1945 production—25,470,974 units—went into civilian replacement channels, giving motorists 40% more tires last year than they got in the peak war year of 1944. Nevertheless, it was pointed out, production of tires for civilians in 1945 was still about one-third under pre-war replacement sales.

As indicated by the accompanying table, truck and bus tire production in 1945 increased by 12% over the previous year but over one-third more such tires went to the civilian replacement market than in 1944. Tractor and implement tires, on which rationing was removed in August, 1945, continued to go to civilians in increasing numbers, 55% more of these tires being made available to civilians last year than in 1944.

As was anticipated, output of airplane tires was cut back drastically after V-J Day and production for the year was 58% less than in 1944. As a result, skilled workers and scarce materials were released for producing badly needed truck, bus, tractor and passenger car tires. Falling military requirements and reduced civilian use also resulted in a drop in output of camelback. Production of the material fell 9% last year.

The report made by the CPA Rubber Division emphasized the fact that use of finished milled stock—rubber ready for tire processing—was the real yardstick of increased production. The 15% increase in the use of this material in 1945 is indicative of the fact that the tire industry actually made industrial progress during the year. Although the industry was confronted with many problems, this increase in the use of finished milled stock is proof that team work between labor and managment did accomplish improved over-all production.

RMA Also Issues Figures

Estimates on tire production in 1945 were issued by the Rubber Manufacturers Association on February 25. Although these figures differ somewhat from those released by the CPA Rubber Division, they were fairly close. For example, the RMA estimates production of passenger car casings last year at 28,147,538 units.

The RMA report, however, showed that 1945 shipments of passenger car tires ran only slightly behind production. Shipments totaling 26,804,197 units represented 95.2% of production in 1945, although 1945 shipments were only 49.1% of the 54,560,384 units shipped in 1941, last year of peacetime production. Exports in 1945 aggregated 212,518 passenger car tires as compared with 586,423 units in 1941. Manufacturers' inventories at the year's end totaled 2,151,539 units as against 3,165,132 in 1941.

The RMA estimates on 1945 production also covered passenger truck and bus tubes. Production on tubes was estimated at 41,101,866 units, which compares with 57,432,767 units in 1941. Manufacturers' inventories on tubes were 3,670,544 units on January 1, 1946, the date on which the industry was permitted generally to use Butyl rubber.

Textiles Still in Short Supply

The report issued by the Rubber Manufacturers Association indicated that textiles used in the tire trade are still critically short. One reason for this shortage as far as the rubber manufacturing industry is concerned is the fact that most manufacturers require larger quantities of textiles to meet peak production schedules set for the year. U. S. Rubber, for example, recently stated it would require at least 20 per cent more textiles in the current year than in the average pre-war year. The major portion of these textiles will be needed for tire cord.

According to reports in the industry, at least two large tire manufacturers have been forced to curtail production on passenger car tires due to the lack of textiles. Other manufacturers may be forced to take such action unless the industry somehow receives additional supplies. The charge has been made that cotton inerests are diverting fabrics and yarns to other industries where manufacturers will pay higher prices. The rubber industry is one of the heaviest users of cotton textiles, annual consumption in terms of raw cotton amounting to between 500,000 and 600,000 bales.

There is some hope in rubber circles that the recent OPA order authorizing incentive increases to textile manufacturers, coupled with the accompanying L-99 order, may result in additional supplies of tire cord, as well as chafer and other fabrics. Some manufacturers believe that as a result of these OPA actions more print cloth will be available for linings for footwear and for rubber clothing, as well as more sheeting for such products as friction tape. Unfortunately, hose and belt duck does not come under the new pricing regulation which means that manufacturers of mechanical rubber goods will not be relieved of textile shortages.

Incidentally, the report is rife in textile circles that the Celanese Corporation of America, which is understood to be planning the manufacture of tire yarn, will not be able to enter this field for some time to come. Although Celanese recently acquired the Tubize Rayon Corporation and all of its viscose facilities with the apparent intention of competing in the production of tire yarn and fabric, economic factors are said to be holding up the intention, including the fact that there is an urgent need for the textile yarns produced at the Tubize plants and that where possible producers are converting from rather than to tire yarns.

Status of Carbon Black

Although there is some talk in trade circles of an impending shortage of carbon black, supplies in general are expected to measure up to demand. This is especially true if consumers are willing to use furnace black pound for pound with channel black. The production of the latter type of black is said to have reached its peak under OPA limitations on natural gas prices. Production of furnace black, however, can be stepped up considerably since less gas is required to produce this type black and at the same time a better margin of profit is

PRODUCTION OF TIRES, CAMELBACK AND FINISHED MILLED STOCKS: 1944 AND 1945

(As compiled by the CPA Rubber Division)

	1944	1945	Percentage Difference
Airplane Tires .....Units	1,414,622	820,556	—58%
Truck & Bus Tires .....Units	14,624,328	16,354,445	12%
Tractor & Implement Tires.....Units	2,105,032	2,695,317	28%
Passenger & Motorcycle Tires...Units	18,899,022	28,292,112	50%
Bicycle Tires .....Units	4,277,674	5,054,477	18%
Camelback .....Long Tons	157,936	135,678	—9%
Finished Milled Stock .....Long Tons	1,015,960	1,166,439	15%
Civilian Replacement Shipments			
Truck & Bus Tires .....Units	4,777,765	6,430,554	35%
Tractor & Implement Tires .....Units	712,877	1,105,975	55%
Passenger & Motorcycle Tires...Units	18,177,244	25,470,974	40%

obtainable. Some furnace black plants which were closed toward the end of 1945 have since been reopened and others can be put back into operation as required.

Demand for carbon black for the current year is estimated at approximately 1,200,000,000 pounds. Consumption last year amounted to 530,000,000 pounds of channel black and 450,000,000 pounds of furnace black. It will be recalled that the use of carbon black was restricted until October, 1945.

Production of channel black in December is understood to have reached an all-time peak and although figures for January production have not been issued, such production is believed to have been maintained at a similar high level. Channel black stocks now in producers' hands are estimated at slightly better than a 30-day supply.

Report on Dutch Rubber

Only a small percentage of the total area of rubber plantations taken over by the Japanese in March, 1942, were taken out of production, according to a report published in the *Economisch Weekblad*, weekly publication of the Netherlands Indies Government's Economic Affairs Department.

The total area of rubber plantations taken over in Java by the Japanese in 1942, the report said, was 244,000 hectares (one hectare equals 2.47 acres). Regular reports were received on 234,894 hectares of this area, 217,603 of which were still planted in rubber up to the middle of last year.

Some 17,291 hectares were uprooted by the Japanese, causing a decrease of about 7 per cent in Java's rubber production. No details were available concerning 9,107 hectares. At first, the report continued, only low-production plantations, which had been under consideration for replanting, were uprooted by the Japanese but later uprooting was carried out on a larger scale to provide wood fuel for various industries.

Rubber plantations uprooted in 1942 and 1943, totalling, respectively, 3,000 and 4,000 hectares, were virtually all replanted with better varieties, but subsequently uprooted plantations were not replanted. This was partly due to the fact that, during the first year, areas uprooted were usually planted in food crops.

In later years, rubber production was limited and principally concentrated in West Java. In 1943 and 1944 production was, respectively, 25,423 and 24,330 long tons, or about one-fifth of Java's 1941 production. Some factories were fitted up to produce only crepe rubber.

On the east coast of Sumatra, some 258,959 hectares were devoted to rubber culture, and of this area apparently 14 per cent, or about 36,430 hectares, were uprooted by the Japanese. Of the latter area, about 1,802 hectares were replanted.

Sumatra's total rubber production in 1944 was estimated at only 13,500 long tons, including 3,500 tons of latex.

Rubber from Latin America

In a statement issued by the United States Bureau of Foreign and Domestic Commerce recently, it was revealed that 16 of the other American Republics supplied the United States with more than 92,000 long tons of natural rubber during the period it was at war against the Axis. The total wartime rubber import figures indicated that imports of rubber from Latin America amounted to approximately 17½% of the total rubber imports of 526,311 tons received from all world sources of supply during the year 1942 to 1944 and the first six months of 1945. The specific figures (in pounds) follow

	1942	1943	1944	1945 (6 months)
Bolivia	354,612	868,224	3,727,289	1,297,408
Brazil	12,855,217	28,142,352	41,873,624	23,763,247
Colombia	534,736	1,659,112	1,271,457	671,582
Costa Rica	463,144	824,626	538,887	224,519
Ecuador	4,405,706	5,091,228	5,891,893	2,025,330
Guatemala	9,762	280,222	328,798	119,046
Haiti	.....	4,543	18,424	12,610
Honduras	36,363	259,865	246,545	178,855
Mexico	12,427,160	17,265,810	15,009,056	12,817,910
Nicaragua	674,697	3,094,614	3,255,798	1,325,745
Panama	16,968	349,063	658,373	229,493
Peru	42,781	86,798	92,975	499,128

Some New Price Regulations

Several amendments to pricing regulations on various types of rubber products have been issued in recent weeks, including the following:

Rubber Flooring: Amendment No. 23 to M.P.R. 149 (Mechanical Rubber Goods) provides for an increase of approximately 11% of manufacturers' ceiling prices for rubber flooring other than neoprene flooring. This increase is allowed under the reconversion formula adopted by OPA. The new ceilings are in dollars-and-cents and are uniform for the entire industry. Manufacturers' ceilings for neoprene flooring continue at their January 6, 1942, freeze levels.

Coated Fabrics: Under the terms of Amendment No. 12 to M.P.R. 478 (Coated and Combined Fabrics) converters and wholesalers must use their March, 1942, cash discounts and transportation charges and report these discounts and charges to OPA. Wholesalers and converters who had not established such discounts and charges in the base period must submit them to OPA for approval.

Rubber Heels: Uniform dollar-and-cent ceiling prices at all levels of distribution in the home replacement trade are established for brown rubber heels, black composition nail-on half soles, and cement-on rubber soles in Amendment No. 15 to M.P.R. 477 (Sales of Rubber Heels and Soles in the Shoe Factory and Home Replacement Trades). Brown rubber heels are now being sold after having been off the market for years.

Rubber Footwear: Simple methods for retailers and wholesalers to determine their ceiling prices on specialty items of rubber footwear not produced during the war and now coming back on the market are provided in Amendment No. 5 to R.M.P.R. 229 (Retail and Wholesale Prices for Certain Rubber Footwear). The methods require retailers to divide their net purchase price for the item by .62 to arrive at the retail ceiling price, while wholesalers simply take the manufacturer's list price and deduct their customary discounts.

Rubber Mats: Manufacturers of rubber mats or matting may now apply to the OPA for individual adjustments in their ceiling prices. This action, covered by Order 56 to M.P.R. 149 (Mechanical Rubber Goods), was taken to avoid any threat to production arising from the use of higher priced raw materials due to a scarcity of reclaimed rubber, normally used for such mats.

Tires and Tubes: Specific trade-in allowances have been established for repairable old tires and tubes turned in by buyers of new ones. This action, covered in Amendment No. 5 to R.M.P.R. 528 (Tires and Tubes), was necessitated by the end of tire rationing and the increasing supply of new tires. The amendment establishes three categories to determine the allowance, if any, for all tires traded-in.

Miscellaneous: Dollars-and-cents ceilings have been established for rubber bands made of GR-S or natural rubber or blends of those two materials in Amendment No. 25 to M.P.R. 220 (Certain Rubber Commodities) and price relief recently granted to manufacturers of sponge rubber has been extended to manufacturers of hard rubber products by Amendment No. 24 to M.P.R. 149 (Mechanical Rubber Goods).

New Company Formed

Florida Rubber Corp., 950 N. W. 72nd St., Miami, Fla., has recently been organized and has succeeded the Florida Rubber Products Co. Employing 75 people, the new company will produce soles, mechanical goods, sponge rubber goods, and reclaimed rubber. Officers of the company include George Brumlik, president and general manager; Albert M. Clark, vice-president and treasurer; Arthur Brumlik, secretary; Rudolph C. Evans, chief chemist and plant manager; John McArthur, superintendent and chief engineer; Warren G. Brumlik, sales manager.

WIDE STRIDES IN SCIENCE DEPICTED BY CHEMICAL SHOW

It is doubtful whether any chemical exposition of the past reflected such wide strides in the application of scientific conclusions to industrial purposes and probably none has revealed so many new product items as did the 20th Exposition of Chemical Industries, held in Grand Central Palace, New York City, the week of February 25. With nearly 400 exhibits on four floors of the Palace, the exposition afforded a brilliant display of chemicals, chemical materials, structural materials, processing equipment, and samples of finished goods. The exposition, as usual, was held under the management of the International Exposition Co., of which Charles F. Roth is president.

Of major general interest was the atomic energy exhibit of the American Chemical Society, which was designed to explain how atomic power came about and emphasized the point that its development in the atom bomb has given a new impetus to research. To this end, twelve panels were shown with appropriate explanations illustrating among others the distribution sources and procurement of uranium, the development of plutonium, nuclear fissions and chain reactions, separation of U-235, and finally a panel suggesting that "the atom can be friendly if men choose," and indicating some applications which can be developed as a source of constructive aids to human progress.

A number of the exhibits were of direct interest to rubber chemists and engineers. On the chemical side, a new line of plasticizers suitable for use with butadiene-acrylonitrile rubbers, polyvinyl chloride-acetate copolymers, polyethylene, etc., was displayed by the Atlas Powder Co., Wilmington, Delaware. The Socony-Vacuum Oil Co., New York, showed a number of softeners and processing aids for rubber and other products. Tributyl aconitate, a plasticizer for nitrocellulose, cellulose acetate, ethyl cellulose, etc., which is reported to have created considerable interest as a plasticizer for certain types of synthetic rubber, imparting particularly good low temperature flexibility to stocks, was displayed by Chas. Pfizer & Co., Inc., New York. Its wide and varied line of emulsions, dispersions, coating compositions and lacquers, was shown by the American Resinous Chemicals Corp., Peabody, Mass. Others displaying chemicals for rubber included the Aluminum Co. of America, Amecco Chemicals, Inc., Commercial Solvents Corp., General Aniline & Film Corp., Glyco Prodcts Co., Hardesty Chemical Co., Koppers Co., Neville Co., and the Phillips Petroleum Co.

Machinery and equipment for both laboratory and factory use was profusely displayed. Of special interest was the Szegvari Attritor, shown by the Union Process Co., Akron, described as the "first radical departure in ball mill type grinding equipment in many years." This unit incorporates a successful combination of the positive mechanical action of colloid mills with the reliable grinding principle of the ball mill. Originally developed for the preparation of compounding ingredients in dispersion form for latex work, the Attritor is now used by many other industries requiring fine grinding of pigments in a liquid medium. A number of magnetic separators, several applicable for use with rubber, were also on exhibit.

As usual, the exposition included exhibits of various types of rubber products for the chemical process field. Products of this nature were found in the booths of the American Hard Rubber Co., Garlock Packing Co., Luzerne Rubber Co., and the U. S. Stoneware Co., Tygon products were also exhibited in the booth of the latter company, as was Reanite, the rubber-to-metal bonding agent.

Coming Events

Mar. 22. Chicago Rubber Group, Hotel Morrison, Chicago, Ill.

Mar. 22. American Institute of Chemists, Building Trades Club, New York, N. Y. (Symposium on Synthetic and Natural Rubber.)

Mar. 28 R. I. Rubber Club, Crown Hotel Providence, R. I.

Apr. 3-5. Society of Automotive Engineers, Aeronautical Meeting, Hotel New Yorker, New York, N. Y.

Apr. 10-12. Rubber Division, A.C.S., Atlantic City, N. J.

Apr. 12. Quebec Rubber & Plastics Group, Hotel Ritz-Carlton, Montreal, Canada.

May 3. New York Rubber Group, Hotel McAlpin, New York, N. Y.

June 7 Philadelphia Rubber Group, Annual Outing. (Tentative).

June 24-28. A.S.T.M., 49th Annual Meeting, Buffalo, N. Y.

Sept. 8-15. American Chemical Society, Chicago, Ill.

Division to Sponsor Luncheon

A joint luncheon of the chairmen and secretaries of all of the local rubber groups and the directors and officers of the Division of Rubber Chemistry, A.C.S., will be sponsored by the Division at the Ambassador Hotel in Atlantic City, N.J., on Friday noon, April 12. The Division will hold a three-day meeting at Atlantic City, on April 10-12, in conjunction with the 109th meeting of the parent society. Full details of the meeting, and abstracts of the papers to be presented, will be found elsewhere in this issue.

CONTINUED GOVERNMENT CONTROL OF GR-S URGED BY LITCHFIELD

Continued government ownership of the nation's GR-S plants was urged by P. W. Litchfield, chairman of the board of the Goodyear Tire & Rubber Co., in a recent statement made at Akron. Mr. Litchfield pointed out that if the availability and output of the government synthetic rubber plants serve to hold the price of imported natural rubber to reasonable levels, the resultant saving to American tire purchasers would soon equal the total government investment in these plants.

Mr. Litchfield estimated that a saving of five cents per pound in the prices of natural rubber would amount to $80,000,000 annually to rubber consumers of the nation, and recalled that under the operation of the pre-war foreign controlled rubber market, the price of rubber ranged from as high as $1.25 per pound under cartel manipulation to three cents per pound when those controls were relaxed.

Regardless of how the question of private versus government ownership may be decided, Mr. Litchfield asserted, synthetic producing plants must be kept in operation throughout 1946 if tire manufacturing plants are to have sufficient raw materials for capacity production. He estimated the capacity of the tire manufacturing plants at 900,000 tons per year with only 250,000 tons of natural rubber expected to reach America during 1946. The difference of 650,000 tons, he declared, must be made up largely from the output of the synthetic plants.

Mr. Litchfield especially recommended against any piecemeal disposal of the government-owned GR-S plants to private interests. Such a move would tend to place government in direct competition with private business, he contended, while the tendency under private ownership would be to obtain higher profits and thus would inevitably invite the fixing of higher prices on the competing natural rubber.

"Under the unceasing pressure of our technicians, our most efficient synthetic plants are now producing at a cost below 15 cents per pound," Mr. Litchfield said, "which compares with earlier costs of 50 cents per pound and is evidence of the ability of the government-owned synthetic industry to protect the public against exorbitant prices of natural rubber as fixed by foreign interests. This progress in reducing the cost is well known to those who control the sale of Far Eastern natural rubber. They know, too, that notable advance has been made in improving the quality of synthetic rubber. Thus the force of competition ultimately will be exerted in fixing price levels, and the measuring sticks will be cost per tire mile and service to the consumer."

With production costs of synthetic rubber reduced to their current levels, he added, the government can sell the output at a profit which will serve to compensate for subsidies paid out in the earlier stages of the operation of these plants.

PHILADELPHIA RUBBER GROUP HEARS TALKS BY CAKE, VILA

The Annual Spring Meeting of the Philadelphia Rubber Group, held on Friday, March 8, at Kugler's Restaurant, Philadelphia, Penna., and attended by approximately 125 members and guests, featured talks on "The Future Outlook for Rubber Hydrocarbons." W. E. Cake, assistant managing director of the Plantations Division of the U. S. Rubber Co., discussed the plantation rubber side of the subject, while George R. Vila, assistant development manager of the Naugatuck Chemical Division, U. S. Rubber Co., covered the synthetic rubber side. Entertainment in the form of variety acts preceded the presentation of both talks.

Discussing the damage to Far Eastern rubber plantations during the war, the present conditions on the rubber estates, and the possibilities of resumed production, Mr. Cake began his talk by listing the factors responsible for the loss in the area of planted rubber in British Malaya and the Netherlands Indies. These factors, he said, are (1) Removal of trees for the purpose of food-stuff planting; (2) Loss of young plantings following abandonment of estate upkeep; and (3) Felling of trees for military purposes.

Considerable destruction and loss of equipment, he declared, was due to the application of the "scorched earth policy" by the Dutch prior to the invasion, and the transfer of equipment by the Japanese to other sites. Latex handling equipment was particularly hard hit. Of the five shiploading installations at ports in Sumatra and Malaya, only one remains in comparatively good condition.

In reference to the labor situation on the plantations, Mr. Cake said that laborers were treated so badly by the Japanese that the mortality rate among them was about 50 per cent. This caused a decrease in available labor today, and is the prime factor limiting the rate at which production can be resumed. In addition, he cited disturbances arising out of the nationalist movement in the Netherlands Indies as another reason for holding up production by preventing the return of the estate staffs to plantations in Sumatra and Java.

During the period of rehabilitation for both Malaya and Sumatra, plans provide for the operation of rubber estates by quasi-governmental organizations. The organization for Malaya, known as the M. R. E. O. C., is already in operation, he asserted, but because of the nationalist troubles, the corresponding organization for the Netherlands Indies is not yet able to function.

On the subject of "Outlook for Synthetic Rubber," Mr. Vila discussed the prospects for a synthetic rubber of better quality. Although present progress appears infinitesimally small, he said, a tremendous amount of research has been devoted to the improvement of synthetics during the war years and is continuing today.

This process of small improvement has already set in, Mr. Vila declared, and then described some of the special types of GR-S available today in production quantities. Among those described were: *GR-S:85,* a hard, tough polymer with a Mooney value of 100 rather than the standard 50 of ordinary GR-S; *GR-S:10,* which utilizes a special grade of rosin soap as an emulsifier and has the advantages of enhanced tack, higher tensile strength with low black or non-black pigment loadings and better flexing characteristics than plain GR-S; *GR-S:65,* a special polymer with low water absorption characteristics developed primarily for insulated wire; *GR-S:25.*

Describing another recent development, the speaker said that a clay masterbatch has become available in production quantities, and that factory trials indicate that it possesses good physical properties and efficient processing characteristics.

Fritz Promoted by Goodrich

Howard E. Fritz

Dr. Howard E. Fritz who has been director of research for the B. F. Goodrich Co., Akron, since 1942, has been elected a vice-president of the company. Dr. Fritz will continue to direct the company's research activities from a new research center, located midway between Akron and Cleveland, which is to be constructed. He graduated in 1914 from Ohio State University, where he received degrees in science and chemical engineering, including that of Doctor of Science. His first assignment on joining Goodrich in 1925 was the managership of a small department where rubber was bonded to metal by the company's Vulcalock process. In 1934 he was put in charge of the development and marketing of Koroseal.

RMA REVEALS CONSUMPTION OF CRUDE, RECLAIMED RUBBER

Complete figures on the consumption of crude and reclaimed rubber in the United States during the war years have been revealed for the first time in a report issued recently by the Rubber Manufacturers Association. Covering the years 1941 through 1945, the report indicates that military necessity spurred the consumption of synthetic rubbers from a little more than 6,000 tons in 1941 to almost 700,000 tons last year.

According to the report, of the 781,259 tons of crude rubber consumed by the United States in 1941, synthetic rubber manufacturers, who were still operating on a pilot plant basis at the time, contributed 4,463 tons of GR-M, 108 of GR-S, and 1,688 tons of all others, or less than one per cent. In 1945, however, 86.8 per cent of crude rubber consumed by this country was synthetic.

The consumption of GR-S, chief synthetic used during the war, jumped from 108 tons in 1941 to 2,579 in 1942, to 131,977 in 1943, to 495,552 in 1944, and to 600,001 in 1945. GR-M consumption increased from 4,463 tons in 1941 to 6,833 in 1942, to 26,205 in 1943, to 46,243 in 1944, but dropped to 42,363 in 1945. GR-I was being produced primarily in laboratories in 1941, and its consumption was increased only slightly to 22 and 304 tons in 1942 and 1943, respectively. In 1944, however, 14,112 tons was consumed, and 43,009 in 1945.

The figures in long tons for the war years are as follows:

Year	*Natural*	*Synthetic*	*Total Crude*	*Reclaim*
1941	775,000	6,259	781,259	251,231
1942	376,791	17,651	384,442	254,820
1943	317,634	170,891	488,525	291,820
1944	144,113	566,670	710,783	251,083
1945	105,406	696,626	802,032	240,780

New York Group Meets May 3

The first meeting this year of the New York Rubber Group will be held on Friday, May 3, at the Hotel McAlpin in New York City. The program for the meeting, now being arranged, will be announced at a later date. At a recent meeting of the group's Executive Committee, it was decided to hold a Summer Outing this year, probably in June, and a committee was named to handle arrangements. The committee is headed by Peter Murawski (DuPont), and includes J. E. Waters (General Cable), H. Frecker (U. S. Rubber), and B. B. Wilson (*India Rubber World*). Suggestions for suitable location for the outing will be welcomed by members of the committee. A Program Committee for the year was also named, with Simon Collier (Johns-Manville) as chairman, assisted by Dr. H. L. Fisher (U. S. Industrial Chemicals), A. P. Stubbs (Manhattan Rubber), L. Cranston (U. S. Rubber), and J. W. Harrison (Thermoid).

COMMITTEE D-11 ON RUBBER PRODUCTS HOLDS MEETING IN PITTSBURGH

That considerable interest is shown in the work of Committee D-11 on Rubber Products of the American Society for Testing Materials was indicated by the large attendance at the meetings of the committee held in Pittsburgh, Penna., on February 26 and 27, during the A.S.T.M. Committee Week. Seventeen subcommittees also convened.

Several important actions were taken by the committee during its sessions, including the organization of two new subcommittees, one to deal with plasticity tests and the others with tests of resilience. The new Subcommittee on Plasticity tests will study means and methods for the processibility of rubber and rubber-like materials. This work will include studies of types of instruments now used in the industry and a collection of data on other instruments used on uncured stocks.

The new Subcommittee on Resilience Tests will develop definitions, specifications, and methods on resilience, hysteresis, and dynamic stiffness of rubber and rubber-like materials. Consideration will be given to determining the energy output expressed in terms of percentage energy input. The subcommittee plans to develop definitions for such terms as dynamic stiffness and dynamic modulus. It was decided to appoint sections to study such problems as rebound, free vibration and forced vibration.

Recommendations of Subcommittees

The Subcommittee on Insulating Tape recommended the withdrawal of the emergency alternate provisions applied to the Specifications for Friction Tape for General Use for Electrical Purposes (D 69-38) and for Rubber Insulating Tape (D 119-38). Both of these standard specifications will be reverted to the tentative status and revised to include a number of the former emergency provisions. This subcommittee reported that consideration is being given to new specifications for thermoplastic jackets. It also recommended a revision and clarification of the ozone test in the Methods of Testing Rubber Insulated Wire and Cable (D 470). The Method of Heat Aging of Vulcanized or Synthetic Rubber by Test Tube Method (D 865) was modified to lower the test temperature from "—25° C." to "—35° C." for material to be used in flexing service.

This subcommittee is responsible for certain emergency alternate provisions applying to several of its specifications for insulated wire and cable. It was decided at the meeting to appoint a steering committee to review these emergency provisions and to study and coordinate the various A.S.T.M. specifications for rubber insulation for wire and cable.

The Subcommittee on Abrasion Tests for Rubber Products presented a revision in the general procedure for Abrasion Resistance of Rubber Compounds (D 394) providing for a change in the speed of rotation of the drum in the National Bureau of Standards Abrader specified in Method B from a value of "40 r.p.m." to "45 ± 5 r.p.m." It was also reported that Method C which uses the U. S. Rubber Co. Abrader is to be studied by the committee during the year. Revisions were also presented in the Test for Tear Resistance of Vulcanized Rubber (D 624-44).

The subject of Life Tests of Rubber Products has received considerable attention in the committee. Further test work is to be undertaken on the following subjects: (1) A study of aging of vinyl chloride, in cooperation with Committee D-20 on Plastics, (2) A study of air oven testing methods, and (3) A study of the GR-S air oven data that are available. The latter two projects are expected to result in revisions and improvements of the present test methods.

The subcommittee responsible for hardness tests has decided to prepare a method covering the use of the Rex gage. This group also recommended the adoption as standard of the Tentative Method of Test for Compression-Deflection Characteristics of Vulcanized Rubber (D 575) and also reported that considerable work is in progress on a study of the Test for Compression Set of Vulcanized Rubber (D 395).

Tests for properties of rubber and rubber-like materials resulting from prolonged contact or immersion in liquids have also received considerable attention during the year. Important changes in the petroleum base Reference Oils Nos. 1 and 3 used in Methods of Test for Changes in Properties of Rubber and Rubber-Like Materials in Liquids (D 471-44T) were recently incorporated in the revised method. This subcommittee is now studying the effect of structure of hydrocarbon immersion media on rubber. A series of tests on this subject is under way.

The Subcommittee on Adhesion Tests reported revisions in the Method of Test for Adhesion of Vulcanized Rubber (D 413-39) and the Method of Test for Adhesion of Vulcanized Rubber to Metal (D 429-39). This group is also studying adhesion terminology in an endeavor to find a better way of expressing the nomenclature used in adhesion work.

The Subcommittee on Tests of Liquid Rubber Products has under way an active program on a study of the shear strength test on various classes of adhesives. A round-robin series of tests is to be run to study various combinations, such as rubber to rubber, fabric to fabric, and metal to metal types of test specimens. Revisions were presented in the Tentative Methods of Testing Rubber Adhesives (D 816-44T).

Study of Cold Boxes

The Subcommittee on Low Temperature Tests for Rubber and Rubber-Like Materials has been making a study of various types of cold boxes used in various laboratories. As a result of this study it is planned to include additional information in the Tentative Recommended Practice for Conditioning of Rubber and Plastic Materials for Low-Temperature Testing (D 832). This will cover such features as adequate controls, methods of maintaining uniform temperatures over the cold boxes, and directions for making the boxes. The committee is also collecting durometer hardness test data at low temperatures. The Tentative Test for Low-Temperature Brittleness of Plastics and Elastomers (D 746) and the Test for Young's Modulus in Flexure of Natural and Synthetic Elastomers at Normal and Subnormal Temperatures (D 797) were recommended for adoption as standard.

Technical Committee A on Automotive Rubber, which functions under the joint auspices of the S.A.E. and A.S.T.M., has been very active during the past year and meetings have been held at intervals of every two or three months. The technical committee reported the completion of four new specifications for hose which provide purchase requirements for the following types: (1) fuel and oil hose, metal lined, coupled; (2) fuel and oil hose, coupled or uncoupled, synthetic rubber tube and cover; (3) fuel and oil hose, braided reinforced, lacquer or cement covered, coupled or uncoupled; and (4) fuel and oil hose, synthetic rubber, wire reinforced circular woven type, lacquer cover.

It was also announced that Technical Committee A had received from the Bureau of Ordnance, U. S. Navy Department, the Distinguished Service Award for meritorious service to the Navy on problems dealing with rubber and rubber-like materials.

Simon Collier, Manager, Inspection and Control Dept., Johns-Manville Corp., New York, N. Y., is chairman of Committee D-11, and Arthur W. Carpenter, Manager of Testing Labs., the B. F. Goodrich Co., Akron, Ohio, is secretary.

Goodrich Buys Hayes Division

B. F. Goodrich Co., Akron, has purchased the airplane wheel and brake division of Hayes Industries, Inc., Jackson, Mich., as part of the company's post-war program to extend greatest possible service to all branches of aviation. Pioneer in the development of airplane tires since 1908, the Goodrich company introduced a new type of airplane brake in 1937 which has since been manufactured under license by Hayes Industries. In acquiring the new wheel and brake division, the Goodrich organization will now supply complete tire, tube, wheel and brake assemblies to the aircraft industry.

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GLEN DISCUSSES GERMAN RUBBER AT SAE MEETING IN DETROIT

At the German Engineering Evaluation Meeting sponsored by the Society of Automotive Engineers at the Horace H. Rackham Educational Memorial, Detroit, Mich., on March 4, Earl W. Glen, assistant director of the Rubber Division of the Civilian Production Administration, delivered a talk on "Observations of the German Rubber Industry." Mr. Glen asserted that in spite of its pioneering work on synthetic rubber, the German rubber industry has not progressed relatively as far as the rubber industry in the United States in the use of their Buna type synthetic rubbers.

Due to the lack of cooperation between the German synthetic production industry and the end-product manufacturing industry about 1935, Mr. Glen stated, it was found that many tire and rubber goods manufacturers were very critical of the Buna rubber that they were forced to use at the beginning of the war. Under this pressure I. G. Farbenindustrie developed Buna S-3 which eliminated some of the production difficulties and improved the performance of rubber products, particularly tires, he explained.

The development by Farbenindustrie of "Koresin" for compounding with synthetic rubber to improve the tackiness, he observed, was claimed to improve the performance of tires, but in spite of these improvements Germany's rate of production of synthetic rubber goods was way below that of the rubber industry in the United States.

Mr. Glen noted that German techniques in the manufacture of synthetic rubber goods were in most instances inferior to modern methods as used in the United States, and that this was particularly true in truck tires, both in tire building and tire curing. However, he pointed out that in some cases improvements in the manufacture of specialty rubber goods were noted such as the calendering of gas proof coated fabrics and large scale continuous curing methods for all types of coated fabrics. Improvements in rayon tire cord fabric quality also would have made their tires more serviceable, he commented, and would have left only the very difficult production bottleneck in milling to contend with.

Other difficulties that Mr. Glen observed in the German rubber industry were created by their own Teutonic type of organization. "Too much of their thoroughness within a given phase of industry stopped within the gates of that branch," he said. "I. G. Farbenindustrie, for instance, jealously guarded its prerogatives on the creation and development of Buna type synthetic rubbers and delivered the Buna, Buna S or Buna S-3 to the rubber industry with an attitude of 'Here it is, now use it.' This was in the beginning backed up by dictates of the German government in order to establish self-sufficiency within Germany, so without the benefit of a long period of cooperative development testing, synthetics were forced upon the German rubber industry in the pre-war years when Germany was making a concentrated effort to prepare for war."

The German rubber industry was in a large degree operating blindly, he observed, for no road test fleets such as we know them in the United States were operated by even the larger companies, though extensive laboratory equipment was found in numerous plants. He indicated that the rubber industry was also denied the benefit of cooperative testing with the German Army and was placed in the position where they simply took orders from the Army and filled them. Only in very rare instances were tire designers from industry privileged to inspect tires removed from Army vehicles.

Mr. Glen observed, however, that German industry did produce several interesting products. Included among these were "Luka Reifen," "Draftband Reifen" and equipment for brass plating metal goods to facilitate bonding synthetics to track blocks and bogie rollers. "Luka Reifen," he explained, was a tire unit which performed the same function as our American Run-Flat tire construction and incorporated a cellular solid rubber filler which replaced the inner tube.

When placed inside of a regular truck tire this unit was slightly in compression and was claimed to be very successful in operation without air. Its principal merit was that its manufacture was completely independent of that of the tire in which it was used and so production on tires could be maintained without the handicaps that were involved in our American production of the Run-Flat construction.

"Draftband Reifen" he described as an interesting product with a demountable feature, which was accomplished by building a tire without a steel base band, using bead wire embedded in a beveled hard rubber base as the surface to mount on a beveled split rim. The tread surface on the tires was the conventional solid tire type, he said, and the principal advantages of this type of unit were considerable simplification of shipping through ability to elongate the unit and eliminate the weight of the steel base band.

Invisible Toe Rubber

An invisible toe rubber, called "Snubbers," has been designed for women who wear toeless shoes. The new product is a small soft rubber toe, molded in "stocking shade" colors, which is worn on the inside of the shoe. Made in three sizes, it seals the open toed shoe and prevents water and dirt from soiling both the stocking and shoe interior. The new rubber toes can be washed. They come in a small plastic carrying pouch which can be conveniently tucked into milady's handbag.

"BIG FOUR" AND RUBBER UNION AGREE ON HOURLY WAGE RISE

An agreement between the country's four principal rubber manufacturers and the United Rubber, Cork, Linoleum & Plastic Workers of America (CIO) was reached on March 2, after eleven days of negotiations in Washington, on an 18½ cents hourly wage increase covering about 100,000 employees. The agreement which will remain in effect until March 2, 1947, was unanimous and canceled strike threats in Akron, which were to have materialized on March 4. A retroactive clause is contained in the agreement which provides for the payment of an additional 12 cents an hour to employees from November 1, 1945, to the first pay period after March 2.

In addition to the hourly wage increase, the agreement also covers payment of double time for Sundays and holidays, negotiation of certain job rate questions at plant levels, and the cooperation of labor and management to increase productivity. No agreement was reached on the union's original demand for a six-hour day.

The wage agreement is contingent on approval by the National Wage Stabilization Board and ratification by the local unions at about forty plants operated by the U. S. Rubber, Goodyear Tire & Rubber, B. F. Goodrich, and Firestone Tire & Rubber companies. Representatives of the union and the four companies present at the negotiations indicated, however, that such approval by the Wage Stabilization Board and union ratification would be mere formalities.

The 18½ cents hourly pay rise is to become effective on the first pay period after March 2. The average hourly wage in the rubber industry was $1.09. Originally the union had asked a wage increase of 30 per cent, or 32.7 cents an hour. Company spokesmen have not indicated whether the "Big Four" would seek price increases to compensate for the cost of the pay rise.

The agreement is expected to be a model for smaller rubber companies because John C. Collet, retiring wage stabilization director, in a recent directive, pointed out that any post-war wage agreement reached in a particular industry would serve as a pattern for others in that industry as long as it was within the national pattern.

There are also a number of smaller companies in the industry which already have made contracts with their local unions. These are known as "open end" contracts. They call for a certain wage increase but also provide that if the general increase for the industry turns out to be higher, the additional money will be paid. An example of this is at the Seiberling Rubber Co., Barberton, Ohio, where a 12-cent hourly wage increase was granted with the provision that if the industry wide increase turned out to be higher, the balance would be paid. Thus, Seiberling presumably will pay an additional 6½ cents.

NAMES IN THE NEWS

WILLIAM H. AIKEN, formerly a captain in the Army Quartermaster Corps, where he was in charge of research and development work on coated fabrics and plastics, has been named assistant manager of the Plastics and Coatings Department in the newly organized Chemical Products Division of the Goodyear Tire & Rubber Co., Akron.

STANLEY W. CAYWOOD, general manager of foreign activities of the B. F. Goodrich Co., has been named president of the company's newly organized subsidiary, International B. F. Goodrich Co., which is to handle exports and plants for the parent concern outside the United States.

THOMAS E. PARKS, JR., who was associated with the Rubber Division of the National Resources Planning Board before entering the Navy in 1942, has been appointed chief of the Appeal Section of the Rubber Division, Civilian Production Administration.

W. W. SCULL, formerly plant manager for the government-owned Louisville, Ky., and Port Neches, Tex., synthetic rubber plants operated by the B. F. Goodrich Chemical Co. and previously chairman of the purchasing committee of representatives of the rubber companies for the building of government plants, has been appointed production manager of Goodrich Chemical.

JOHN D. MANN, formerly director of automotive rationing for the Office of Price Administration, has rejoined the merchandise section of the tire replacement division of the B. F. Goodrich Co., Akron.

HARVEY S. FIRESTONE, JR., president, Firestone Tire & Rubber Co., who has been acting as general chairman of the State of Ohio for the United Service Organizations, was recently presented an Award for Distinguished Service by the USO "in recognition of distinguished service to the nation through United Service Organizations."

WILLIAM G. SHIPMAN, formerly engineer and plant manager with Babcock and Wilcox for ten years, has been appointed by the Graver Tank & Manufacturing Co., Inc., as plant superintendent at East Chicago, Ind.

ALICE J. GITTER, first woman to have been graduated in ceramic engineering in the United States, has joined Whittaker, Clark & Daniels, Inc., New York, as technical consultant on non-metallic minerals.

CHESTER A. BROWN, who has served as assistant general manager for the past three years of the Baytown, Texas, synthetic rubber plant, operated by the General Tire & Rubber Co. and the General Latex & Chemical Corp., has returned to the General Latex & Chemical Corp., Cambridge, Mass., as plant manager.

HARVEY S. FIRESTONE, JR., president of the Firestone Tire & Rubber Co., Akron, has been appointed a member of the Thomas A. Edison Centennial Committee, which will plan formal commemorations for Edison's 100th birthday anniversary in 1947.

JOHN H. SEATON, who has been associated with the Industrial Products Division of the B. F. Goodrich Co., Akron, since 1927, and as the division's chief design engineer since 1942, has been named manager of the Aeronautical Manufacturing Division of the Goodrich organization.

DR. ERNEST J. JOSS, formerly manager of the Des Moines, Iowa, ordnance plant operated by the U. S. Rubber Co., has been assigned to the company's general offices in New York as administrative assistant to ERNEST G. BROWN, vice-president and general manager of the mechanical goods, general products, and "Lastex" yarn and rubber thread divisions.

MAJ. NORMAN A. GLANTZ, who was associated with the B. F. Goodrich Co., Akron, for 13 years before reporting for active duty in the Army in April, 1942, has been awarded the Army Commendation Ribbon in recognition of his outstanding achievements as rubber coordinator at the Air Technical Service Command, Wright Field, Ohio.

J. WARREN KINSMAN, general manager of the Fabrics and Finishes Department of E. I. du Pont de Nemours & Co., Inc., has succeeded JOHN J. RASKOB as a member of the company's board of directors.

HAROLD S. MEYER, who has served in the patent law department of the B. F. Goodrich Co., Akron, since 1928, has been appointed head of the department.

AMES B. HETTRICK, manager of the Piney River, Va., titanium dioxide plant of the Calco Chemical Division, American Cyanamid Co., has been appointed assistant manager of Calco's Pigment Department. He will make his headquarters at Bound Brook, N. J.

COL. WALTER M. SCOTT, recently released from active duty, and formerly head of the Cotton Chemical Finishing Division of the Southern Regional Research Laboratory at New Orleans, La., has been named director of that laboratory, succeeding the late D. F. J. LYNCH.

R. T. HICKCOX, of the research department of Goodyear Tire & Rubber Co., has been assigned to the Los Angeles sales offices of the company representing the Plastics and Coatings Department of the company's newly-organized Chemical Products Division.

C. L. FOUTZ, formerly factory manager for U. S. Rubber at the Charlotte ordnance plant, and subsequently acting general manager of the company's munitions division, has been appointed director of manufacturing for U. S. Rubber Export Co., Ltd.

HARRY P. SCHRANK, vice-president, Seiberling Rubber Co., has been appointed a member of the board of directors of the University of Akron, succeeding P. W. LITCHFIELD who has retired as a director after 30 years of service. MR. SCHRANK is a graduate of the university.

DEWITT THOMPSON, recently discharged from the Navy after 46 months of service and formerly assistant general manager of the Mathieson Alkali Works, New York 17, N. Y., has joined the sales department of the Heyden Chemical Corp., New York 1, N. Y.

DR. WALDO L. SEMON, director of pioneering research of the B. F. Goodrich Co., Akron, has been unanimously selected by the Alumni Association of the University of Washington, Seattle, Wash., as "Alumnus Summa Laude Dignatus" (alumnus worthy of highest praise) of 1946.

LAWLER B. REEVES, recently discharged from the Army Air Forces as a lieutenant colonel and previously associated with the U. S. Rubber Co. at Oklahoma City, Okla., in the Gillette Division, has been appointed sales manager of airplane tires by the company.

HARRY H. RICE, who served for three years as head of the Army Physical Training Program at the University of Maryland, College Park, Md., has been appointed manager of athletic goods sales of the Pennsylvania Rubber Co., Jeannette, Penna.

EMERICK L. HOLLOWELL, formerly a colonel in the Army General Staff Corps and who spent 18 years in the wholesale and retail tire and accessory business prior to entering the service, has been named vice-president and managing director of the newly formed Dayton Rubber Export Co., a division of the Dayton Rubber Manufacturing Co., Dayton, Ohio.

BOSTON RUBBER GROUP HEARS TALKS ON FLEXIBLE PLASTICS

Approximately 450 members and guests attended the Spring Meeting of the Boston Rubber Group, held in the Ball Room of the Copley Plaza Hotel in Boston, Mass., on March 8. The meeting featured a program on "Flexible Plastics," presented by the Bakelite Corporation, and a special display of such materials was exhibited. It was announced during the meeting that the group would hold the usual outing, probably in June, and that James Christopher (Titanium Pigment) would act as chairman of the outing.

The meeting got under way with a brief introduction by W. J. Connelly, manager of the Consumers Relations Division of the Bakelite Corp. Mr. Connelly gave a brief review of the plastics materials field and revealed that from the standpoint of production and consumption the vinyl resins had replaced the acetates in second place, the phenolics still retaining first place. He also showed numerous samples of finished vinyl products, including shower curtains, baby pants, desalination kits, extruded materials, and some molded types.

Following this brief talk, C. W. Patton, manager of Bakelite's Coating and Adhesive Materials Division, discussed "Flexible Coatings and Adhesives." Mr. Patton first reviewed the conventional processes employed in handling flexible coatings and adhesives, stating that resins which have relatively high vinyl chloride content and molecular weights in the neighborhood of 130,000 produce the most desirable end use properties, since they can be highly plasticized at room temperature to give good flexibility, retain this flexibility at lower temperatures, and exhibit good resistance to surface marring at elevated temperatures.

Mr. Patton then went on to discuss a new group of vinyl chloride-acetate resins of the high vinyl chloride, high molecular weight type, which in some instances completely eliminate the need for volatile solvents and in other cases greatly decrease the amounts and cost of volatile solvents involved. These resins, he explained, are available as dry white powders, and one of them can be utilized by simply dispersing it in plasticizer together with appropriate fillers, pigments, and stabilizers on a 3-roll mill to form a paste.

This paste, he continued, for which the term "plastisol" has been coined, meaning a colloidal dispersion of resin in plasticizer, is a dispersion of resin and not a solution in the ordinary sense of the term. When the paste is applied to various surfaces and heated to approximately 350° F. for an instant, the plasticizer becomes a very active solvent and immediately dissolves the resin particles to form an homogeneous composition which, upon cooling to room temperature, results in a tough, rubbery film. Since there are no volatile ingredients present, and since it is relatively fluid, the material can be used in low pressure molding work.

In cases where it may be desired to have a final coating composition containing relatively small amounts of plasticizer, it is possible to use small percentages of volatile carriers to complement the plasticizer present in these resins, according to the speaker, so as to thoroughly wet the resin and produce a sufficiently fluid mix to be readily applied. The term "organosol" has been applied to this type of compound, referring to a colloidal dispersion in an organic liquid. These dispersion resins, he added, can not only be compounded into flexible coating materials, for cloth and paper, but can also be used for the production of articles by dipping, such as gloves.

The final speaker was Gilbert Shaw, manager of Bakelite's Calendering and Molding Materials Division, who discussed "Calendering and Molding of Elastomeric Materials." Mr. Shaw covered the field of these two subjects, emphasizing the point that injection molding of the vinyl resins accounted by far for the greater consumption of these resins, and that very little went into compression molding. Since little injection molding is done in the rubber field, the expanding use of the vinyl resins represented a threat to rubber production, the speaker said, and he showed various samples of molded plastic parts which were replacing the rubber parts formerly used.

Use of Calcium Carbide

Lack of natural petroleum resources and shortage of carbohydrate material during the war led the German chemical industry to rely on calcium carbide for the raw materials needed to make synthetic rubber, plastics, and a wide variety of other chemicals. Among the many developments resulting from this are: (1) Large-scale conversion of acetylene to ethylene by catalytic reduction, the ethylene being used for the manufacture of styrene for Buna S, polyethylene for lubricating oil, and for the manufacture of ethylene glycol; (2) A new butadiene synthesis involving reaction of formalin with acetylene; (3) Production of large quantities of vinyl ethers of methyl, ethyl, isobutyl, and higher alcohols, some of which were widely used as lacquers and adhesives as straight polymers and copolymers with other vinyl compounds.

So-Lo Works, Inc., Loveland, Ohio, has announced that natural rubber is again being used in its So-Lo mender for all articles of rubber, leather and cloth. Formerly marketed in a tube, So-Lo is now packaged in a can.

SEIBERLING RUBBER REGISTERS 35,000 SHARES PRIOR PREFERRED

The Seiberling Rubber Co., Barberton, Ohio, has filed with the Securities and Exchange Commission a registration statement covering 35,000 shares of cumulative prior preferred stock, $100 par value. Underwriters will be E. H. Rollins & Sons, New York City.

The company proposes to offer the holders of the 14,756 outstanding shares of its $2.50 cumulative convertible prior preference stock the right to exchange two shares of prior preference stock for one share of prior preferred. Any prior preference shares not exchanged will be called by the company for redemption and prior preferred shares not taken in exchange will be purchased by the underwriters. The public offering price will be supplied by amendment.

The proceeds from the sale of the prior preferred stock would be used by the company to retire its $1,300,000 of fifteen-year 4 per cent sinking fund debentures, and to retire the 14,756 shares of prior preference stock. The balance of the proceeds would be added to the company's general fund.

Wilmington Expands Sales Staff

Wilmington Chemical Corp., 10 E. 40th St., New York 16, N. Y., has announced several additions to its technical sales organization. Joseph M. Hoopes, recently associated with E. I. du Pont de Nemours & Co. at its Experimental Station and formerly active in rubber chemical sales for duPont, will represent the company in the New England area. Rolf G. Grote, who is the son of Walter H. Grote, Director of Export for the Philblack Division of the Phillips Petroleum Co., will cover the territory from Southern New Jersey to North Carolina, while the Canadian-Buffalo territory will be handled by R. J. Davidson, recently of the R. C. A. F. In addition, Wilmington is expanding its product line, with the introduction of new chemicals for the rubber industry and thermosetting resins for use in the plastics field.

Chemurgic Group To Meet

The eleventh annual Chemurgic Conference of Agriculture, Industry and Science, sponsored by the National Farm Chemurgic Council, Inc., will be held at the Hotel Statler, St. Louis, Mo., on March 18, 19 and 20. Among the papers and speakers to be heard at the three-day conference are the following: "Some New Contributions to Every Day Comfort," by Dr. M. C. Teague (U. S. Rubber); "Chemurgic Fabrics," by Dr. Frederick Bonnet (American Viscose); "Plastic Developments in 1946," by J. R. Turnbull (Monsanto Chemical); "Industrial Research and Chemurgy," by Dr. Swaine (American Cyanamid); "Thanite," by Theodore Marvin (Hercules Powder); and "Research Makes Jobs," by L. F. Livingston (Du Pont).

FINANCIAL NEWS

GOODYEAR TIRE & RUBBER CO. REPORTS NET OF $15,136,816

Goodyear Tire & Rubber Co. has reported a net profit of $15,136,816 for the fiscal year ended December 31, 1945, after deducting all charges, including provisions for Federal and foreign income taxes, amortization of war facilities, and setting up a reserve of $2,500,000 for property adjustments and other contingencies. The profit is equal to $5.87 a common share and compares with the 1944 net of $15,204,270, or $5.90 a share.

Consolidated net sales in 1945 are reported as $716,176,748. This compares with $786,722,287 for 1944, the decrease reflecting the cancellation of war contracts at the end of hostilities. The company's sales include its expenditures and fees under cost-plus-fixed fee contracts, but do not include a substantial volume of production in three synthetic rubber plants owned by the government and operated by the company.

There was a write-off of an unamortized balance of $24,257,691 expended under Certificates of Necessity in the purchase and construction of buildings, machinery and equipment during the war period. This was offset by related adjustments aggregating $25,100,000 through reduction of renegotiation liability for war contracts of current and prior years, consequent reduction of Federal income and excess profits taxes, and reduction in property adjustment reserves provided in this connection in prior years.

Since V-J Day $432,440,000 of government contracts allotted to the company have been cancelled and liquidation of claims arising from them are reported proceeding satisfactorily. Taxes of all kinds, including duties, levied on the consolidated companies amounted to $83,752,000 of which $69,988,000 is in the United States and the remainder in foreign countries. United States Federal income and excess profits taxes amounted to $38,610,000 and United States Federal excise tax on tires and tubes amounted to $22,570,000.

The report shows net working capital of $152,472,000, and the ratio of current assets to current liabilities of five to one. Current assets amounted to $190,417,353 and current liabilities were $37,945,338, compared with $179,808,937 and $57,146,555, respectively, a year earlier. Of this year's current assets, $44,925,568 is cash, $83,115,125 is inventories, $12,143,704 is United States Treasury notes, $35,965,702 is accounts and notes receivable, and $14,267,254 is terminated war contracts claims receivable.

Foreign investments held by the company, excluding minority shareholders' equities, amounted to $29,932,000, including approximately $6,993,000 of cash representing working capital of the company's various foreign interests required in the course of business. The revolving bank credit of $100,000,000, negotiated in 1943 to provide working capital for war production, has been terminated.

A statement accompanying the report indicates that the company has acquired from the government the tire plant at Topeka, Kan., which was under construction when the relative war production contracts were cancelled. During the year the company also brought into production its new factory near Mexico City, and commenced construction of a Goodyear factory at Uitenhage, Union of South Africa, for the production of tires and mechanical rubber goods for the South African market. The latter investment was financed by subscriptions of the South African public to an issue of 750,000 five per cent cumulative redeemable preference shares of the Goodyear Tire & Rubber Co. (S. A.), Ltd., and by purchase of the equity capital by the parent company.

The company's plant in Sweden, largely idle during the war, was reported to have resumed profitable operations. It was also disclosed that a factory for the manufacture of plastic raw material was nearing completion at Niagara Falls, N. Y., and that a factory for expanded manufacture of mechanical goods had been bought at Lincoln, Neb. Small rubber manufacturing plants were started during the year in Colombia, Venezuela and Cuba.

Rome Cable Corporation

Nine months to December 31: Net profit of $217,899, which is equal to $1.14 a share, and which compares with $402,662, or $2.12 a share, in 1944. December Quarter: Net profit of $46,126, or 24c a share, against $144,040, or 76c a share in 1944.

Flintkote Company, Inc.

Year Ended December 31: Consolidated net income of $1,643,285, which is equal to $1.32 a common share, as against $1,477,394 or $1.38 a share the year before. Net sales amounted to $37,023,416, as compared to $37,280,966 in 1944.

United Carbon Company

Year Ended December 31: Net profit of $2,263,867, which is equal to $5.69 a share, and which compares with $2,232,286, or $5.16 a share in 1944. Net sales increased to $14,458,738 from $13,456,724 the year before.

B. F. GOODRICH CO. REPORTS NET INCOME OF $12,313,501

Consolidated net income of $12,313,501, after deducting all charges, including $31,243,000 for estimated federal and foreign income and excess profits taxes and a reserve of $3,500,000 for contingencies, has been reported by the B. F. Goodrich Co. After allowing $5.00 a share on the preferred stock, this was equal to $7.84 a share on the common stock, which compares with a net of $12,015,842, or $7.64 a common share, in 1944.

Net sales in 1945 aggregated $372,082,813, a decrease of 11.3 per cent over sales of $419,294,119 reported for the previous year. As in previous years, 1945 net sales do not include a substantial volume of production in plants operated by the company for the government on a cost-plus-fixed-fee basis.

Renegotiation of war contract prices for 1944 has been completed, the report says, and reserves provided in the accounts for that year were sufficient to absorb its effect. The management believes no refund should be necessary as a result of renegotiation of 1945 war contract prices.

Current Assets Higher

The consolidated balance sheet as of December 31, 1945, indicates current assets of $129,477,241 and current liabilities of $23,217,233, as compared with $118,179,745 and $43,409,482, respectively, a year earlier. Inventories at the year-end were $54,975,826, as compared with $56,794,357 at the end of 1944.

Throughout the final months of the war, the report says, production of synthetic rubber was carried on at levels exceeding rated capacities in each of the three plants—at Louisville, Ky., and Borger and Port Neches, Tex.—which the company constructed and operates for the government. In 1945 these plants turned out 173,472 long tons, a greater annual tonnage than the synthetic rubber plants operated for the government by any other company.

Start of operations at its new tire plant at Miami, Okla., and the construction by the company of another tire plant at Tuscaloosa, Ala., originally begun for the government as a war measure but later purchased by the company, were among the highlights of its 1945 operations, according to the report. The formation of the B. F. Goodrich Chemical Co. as a separate division of the company was also cited as a notable happening of the year.

The report pointed out that the reopening of world trade channels since the war's end has been marked by resumption of increasing activity in its International Division. It said that sales are increasing in line with the relaxation of export controls and new foreign sales and manufacturing connections are being made.

Trumbull Joins Rubber Reserve

H. L. Trumbull

Dr. Harlan L. Trumbull, director of synthetic rubber research for the B. F. Goodrich Co., Akron, has been named manager of the research and development division of the Office of Rubber Reserve on a temporary basis. Dr. Trumbull carried on many government assignments during the war, at one time devoting nearly eight months to studies on possible development of rubber cultivation in this country and neighboring countries. Born in Iowa, Dr. Trumbull received his bachelor and master's degrees in chemistry from the University of Chicago. He was an instructor in chemistry at the University of Washington from 1911 to 1917 and a captain of the chemical warfare service during World War I. Joining Goodrich in 1919, he was appointed manager of chemical research three years later. He later became assistant to the research director and subsequently director of textile research. During Dr. Trumbull's absence from Goodrich, E. A. Willson will be acting director of synthetic rubber research, and Dr. R. A. Crawford will serve as acting director of textile research.

Form MarBo Products Company

MarBo Products, Inc., is the name of a newly-organized concern which will shortly enter the manufacture of latex products, including gloves and bathing caps, at a plant in Bantam, Conn. The firm is headed by Francis C. O'Donnell as president and treasurer and Martha B. Hanley as secretary. John E. Brandien, who has had sixteen years of experience in the latex dipped goods field, and who has been with the Providence, R. I., plant of the U. S. Rubber Co. for the past 4½ years, will be factory manager. The plant at Bantam is now under construction and the company's current mailing address is P. O. Box 132, Waterbury, Conn. When completed, the Bantam plant will employ between 20 and 30 workers.

Martin Promoted By U. S. Rubber

Luther B. Martin, director of the tire development and research department of the U. S. Rubber Co. since last March, has been appointed technical director of the production department of the company's tire division. In his new capacity Mr. Martin will be a member of the staff of C. L. Wanamaker, production manager of the tire division. Mr. Martin joined the U. S. Rubber Co. in April, 1918, as a chemist at the company's Hartford Rubber Works, Hartford, Conn., later being promoted to chief chemist and factory manager. In 1929 he was transferred to Detroit, where he became manager of tire quality and later assistant director of tire development. Replacing Mr. Martin as director of the tire development and research department is Dr. Arthur W. Bull, who became associate director of tire development in 1945, and who served during the war as development manager in the company's production of self-sealing fuel tanks for military planes.

Carbon Black Plants on Block

Seven completed channel type carbon black plants constructed by the government during the war have been offered for sale by the War Assets Corporation. The plants contain machinery and equipment for the manufacture of carbon black, including burners, scrapers, conveyors, pulverizers, loading and bagging equipment, machine shop and laboratory equipment. Included among the plants offered for sale and the companies which operated them are the following: two plants at Odessa, Tex. (United Carbon Co.); and plants at Guymon, Tex. (Cabot Carbon Co.); Seagraves, Tex. (Columbian Carbon Co.); Sunray, Tex. (Continental Carbon Co.); Monument, N. M. (Chas. Eneu Johnson & Co.); and Eunice, N. M. (Panhandle Carbon Co.).

SAE Plans Aeronautic Meeting

The Society of Automotive Engineers, Inc., has scheduled an Aeronautic Meeting at the Hotel New Yorker, New York City, from April 3 to 5 to discuss future engineering requirements of commercial and civil aviation in the United States. Included among the papers to be given is "Pneumatic Tires for Modern Airplanes," by R. D. Evans, of the Goodyear Tire & Rubber Co., Akron.

Quebec Group to Hear Gay

Major Glen Gay, assigned to the Chemical Warfare Laboratories of the Department of National Defense, Canada, will be the principal speaker at a meeting of the Quebec Rubber and Plastics Group to be held on Friday, April 12, in Montreal. Maj. Gay will discuss his recent trip to Germany.

Zeller Promoted by Cabot

Josef D. Zeller

Josef D. Zeller, who has been engaged in technical sales for Godfrey L. Cabot, Inc., Boston, Mass., for the past several months, has been promoted to the post of associate technical director of the company. Born in January, 1906, at Mobile, Alabama, Mr. Zeller received his B.S. in Chemical Engineering from the University of Alabama in 1931. From 1933 to 1943 he was associated with the tire development department of the U. S. Rubber Co. at Detroit, Mich., and has been associated with Cabot since that time.

Gates Technical Club Meets

Gates Technical Club of the Gates Rubber Co., Denver 17, Colo., held its first meeting of the year recently at the Denargo Cafe in Denver, with approximately 100 members and guests attending. The guest speaker of the evening was Ed Cunningham, of Stanco Distributors, Inc. His talk was entitled "Rubber: A Versatile Engineering Material." Mr. Cunningham discussed the dynamic properties of rubber when used for springs and shock absorbers, and compared such properties in neoprene, Perbunan, Hycar, GR-S and natural rubber, showing how these properties varied for a given material as the temperature varied. Mr. Cunningham's talk was followed by a movie.

Settle Anaconda Wire Suits

The settlement for $1,626,000 of the civil suits brought by the government against the Anaconda Wire & Cable Co. for alleged irregularities in the manufacture and testing of wire and cable for the Army and Navy was announced on February 28 by U. S. Attorney John F. X. McGohey. The suits, filed under the False Claims Act, which provides double penalties, followed criminal actions which ended in the conviction of the company and four officials and employees in January, 1944.

LOS ANGELES NEWS

The March meeting of the Los Angeles Rubber Group, held at the Mayfair Hotel on the first Tuesday evening of the month, was sponsored by the Kirkhill Rubber Company. It was done with the bigness and the finesse that characterizes Kirkhill programs whenever staged.

The entertaining features of the program included three vaudeville acts. There was a girl singer whom the audience liked especially well and a magician who did several clever tricks. A xylophone player formerly featured on the "Barn Dance" did his parts very acceptably.

The speaker of the evening was Harrison Wood, news commentator whose regular broadcast over the Mutual network is known as "This Changing World." He conducted his part of the program in much the same vein as his radio feature is conducted.

Table favors furnished by Kirkhill were the non-skid rubber bath mats manufactured by this company. The other prizes were fine pieces of merchandise including a pressure cooker, a traveling case and other items of like quality.

The attendance ran close to 170 members and friends with a very large representation from the company sponsoring the program.

Several articles recently published in western newspapers hint broadly that Los Angeles stands a chance of becoming first in rubber manufacture in the world. Today the city stands as one of the two largest in production of synthetic rubber and holds the record that it has held for some years of being second in the world in the production of tires—second only to Akron.

Local enthusiasts are hopeful that synthetic rubber will hold the place it has gained during the war years and go on from there to heights previously dreamed about but not until now realized.

One writer points out this fact: During the 31 days that it recently took an ocean going vessel to deliver 2,600 tons of natural rubber which came from Ceylon to Los Angeles harbor, one unit of a local synthetic rubber plant produced more rubber than the ship delivered. It was pointed out by this writer also that more than 350,000,000 lbs. of rubber was produced by the local plants since 1943, enough rubber to make 35,000,000 passenger tires, a large figure when the prewar production of only 57,000,000 for the entire country is considered. Maximum local production would supply enough rubber to make 75,000 tires every day, or one set and two tires for spares each year for every car running in the western states. It would take 90,000 plantation workers tapping 30,000,000 trees, this writer declares, to duplicate the output of twelve hundred technicians.

The saving of time is another point given much emphasis. A Los Angeles writer points out that from the time a seed for a rubber tree is planted until a tire actually is produced from the sap of the resulting tree no less than seven years must pass, but that as long as the local synthetic plants are operating no person is very many weeks away from his next finished tire.

The "fight" for the preservation of the local plants and even their enlargement is being pushed quite vigorously in the local newspapers, and the development of the city in relation to its rapidly increasing industries is tied up to a considerable degree with the retention of this particular industry, the promoters state.

George R. Steinbach, who has been Ed Royal's right bower at the offices of H. M. Royal, Inc., for ten years, has purchased the Atlas Sponge Rubber Company at 806 E. 61st Street and took over management of that concern on March 1. Mr. Steinbach is a young man but he has had a world of experience in the rubber industry and has touched the industry from several different angles. His company specializes in sponge rubber and has been a successful going concern for some years.

Charles H. Churchill who has been with the B. E. Dougherty Company for some time has resigned his position there, in order to give all his time to the Sterling Rubber Products Company at 109 West College Street. Mr. Churchill is another young man who has had plenty of experience in this industry and from various angles and has been a partner in the company since it was organized more than a year ago. The other partner is David Clavin. The offices have been moved to 109 West College Street very recently but the factory is still at 539 S. Clarence Street.

Gilsonite Names Distributors

American Gilsonite Co., Salt Lake City, Utah, recently formed by the Standard Oil Company of California and the Barber Asphalt Corp., has named two distributors of its product, Barber Gilsonite. American Bitumals Co., San Francisco, Calif., has been appointed distributor in the United States and Canada, while the Barber Asphalt Corp., New York City, will handle overseas distribution.

California Hears Howlett

A meeting of the Northern California Rubber Group was held at the Claremont Hotel, Berkeley, Cal., on February 27, with Dick Howlett, technical representative of Stanco Distributors, Inc., New York 4, N. Y., presenting a talk on "Butyl Rubber for Inner Tubes." Mr. Howlett discussed the program followed by his company's fleet of test cars in Texas, where the performance of the Butyl tubes was compared with natural and synthetic types. The superior air-holding qualities and improved tear resistance were the major factors in favor of the Butyl tubes, according to Mr. Howlett. The next meeting of the Group will be held on March 22, with plastics featured as the theme. Harry Kline, of Reichhold Chemicals, Inc., Detroit, Mich., will deliver a talk on "Plastics," while C. E. Sanford, of the Dow Corning Corp., Midland, Mich., will discuss "Silicones."

Plans Factory in West

American Anode, Inc., a subsidiary of the B. F. Goodrich Co., Akron, will construct a manufacturing and processing plant in Los Angeles, Calif., to make latex compounds for use in coating metals, the manufacture of drug sundries, for cord dipping, and for coating paper, textiles, etc. The new plant, to be erected as rapidly as possible in East Los Angeles near the Goodrich factory on Olympic Blvd. and Pacific Ave., is expected to be in operation late this year. In full production the plant is expected to produce about 4,000,000 pounds of finished latex compounds annually. The plant also plans to have storage facilities for more than 30,000 gallons of latex.

Low Temperature Symposium

A symposium on "Effects of Low Temperatures on Materials Used in Constructional Applications," under the auspices of the Philadelphia District of the American Society for Testing Materials, is scheduled to be held at the Franklin Institute, Philadelphia, Pa., on the afternoon and evening of March 19. Rubber, plastics, ferrous and non-ferrous metals will be covered specifically. Five papers will be read during the day, including one on "Behavior of Elastomers at Low Temperatures," by J. W. Liska, of the Firestone Tire & Rubber Co., Akron.

A. S. T. E. Schedules Exposition

The American Society of Tool Engineers has scheduled its fifth exposition at the giant Cleveland Auditorium in Cleveland, Ohio, from April 8 through April 12. Built around the annual convention of the Society, the exposition will cover approximately 400 different classes of products of interest to production engineers. Many of the items to be exhibited will be entirely new, representing war-time developments not previously displayed publicly.

NEW POLYMERS AUTHORIZED BY OFFICE OF RUBBER RESERVE, RECONSTRUCTION FINANCE CORPORATION

Listed below are types and properties of new experimental GR-S polymers (including GR-S latices) which have been authorized by the Office of Rubber Reserve, Reconstruction Finance Corporation, since publication of those listed in our preceding issue. Procedures for the distribution and sale of these polymers will be found in our October, 1945, issue.

X—Number Designation	*Manufacturing Plant*	*Date of Authorization*	*Polymer Description*	*Special Characteristics*
X-284 X-286 X-287	General (Baytown) General (Baytown) General (Baytown)	2/7/46 2/7/46 2/7/46	These three experimental polymers are of a rosin acid GR-S type varying the modifier used; 35-45 Mooney viscosity; 100 parts GR-S to 46 parts EPC Black.	X-284 and X-286 are being made to test various modifiers; with X-287, modified with standard GR-S type modifier, acting as control.
X-285	U. S. Rubber (Naugatuck)	2/11/46	Butadiene/Styrene polymer with an auxiliary chemical to produce high gel content in the polymer, shortstopped with hydroquinone and stabilized with 1.5 BLE; salt acid flocculated; 60 Mooney viscosity.	This material should show superior processing and very low shrinkage characteristics. For use in footwear stocks, wire insulation, extruded mechanical goods and other types of products where these characteristics are desired.
X-288	Firestone (Akron)	3/5/46	GR-S latex with a high solids content of 55-60% with Daxad and potassium castorate as emulsifiers.	General purpose use.
X-293	National Synthetic (Louisville)	3/5/46	Similar to Type II latex, with Daxad emulsifier, hydroquinone shortstopper and Stalite antioxidant.	For use in adhesives. Dry polymer from this latex is so sticky the Mooney is too low to be measured.

Expand Naugatuck Division

The U. S. Rubber Co. will spend more than $2,000,000 on a program to expand the facilities of its Naugatuck Chemical Division. The new expansion is part of a three-way program to meet the increased demands for rubber chemicals, latex, dispersions and agricultural chemicals; for the production of new plastics; and to further general scientific research. The expansion includes the construction of eight new buildings, all of which are expected to be in operation by the end of 1946. Ground will be broken in Naugatuck, Conn., in April for a new, modern laboratory and a new pilot plant which, when completed, will increase the Division's laboratory and pilot plant facilities by more than 50 per cent. Also scheduled to start construction in April are a new plant for the production of rubber chemicals, another plant for the production of small volume products, and a new building to house service departments.

Hycar Price Reduced Again

The sixth price reduction in a period of five years on Hycar has been announced by the B. F. Goodrich Chemical Co., Cleveland 15, Ohio. Under the new schedule, Hycar OR-25 and Hycar OS-10, in dry rubber form, range in price from 36c to 38.5c per pound, depending upon quantity, while Hycar OR-15 ranges from 43c to 45.5c. In latex form, Hycar OR-25 and Hycar OS-10 range in price from 34.5c to 39.5c, while Hycar OR-15 ranges from 41.5c to 46.5c.

Goodyear Expansion Underway

The program of research and development launched by the newly created Chemical Products Division of the Goodyear Tire & Rubber Co., Akron, is expected to create new uses in a wide range of products developed during the war. To speed up the program, the company is now building a new Chemical Division Development Laboratory in Akron at a cost of $1,000,000 to supplement the work of the present $1,325,000 Goodyear Research Laboratory. The development program is divided into the following fields: film and packaging; new types of adhesives; paper and fabric coating; wall-coverings and floorings; synthetic fibers; and frothed products of natural and synthetic rubber latex. The company is also building a $1,500,000 chemical plant at Niagara Falls, N. Y., for the production of vinyl chloride copolymers and related resins.

Plan Symposium on Rubber

A Symposium on Synthetic and Natural Rubber, sponsored by the New York Chapter of the American Institute of Chemists, will be held at the Building Trades Club, 2 Park Avenue, New York City, on Friday evening, March 22. Speakers will include Dr. L. B. Sebrell, Director of Research, Goodyear Tire & Rubber Co., and Dr. J. N. Street, Assistant Director of Laboratories, Firestone Tire & Rubber Co. Dr. Lloyd Taylor, chairman of the New York Chapter of the Institute, will preside at the Symposium. Dinner will be served at 6.30 P.M. sharp.

Tire Plants for Sale

Two partially completed buildings at Norwalk, Conn., which were to have been used by the Norwalk Tire & Rubber Co. in the manufacture of tires, together with a considerable quantity of construction material for their completion, have been offered for sale or lease by the War Assets Corporation. The main building, a four-story structure with basement, is 70 per cent completed. It is 82 feet wide, 218 feet long and contains approximately 87,750 square feet of floor area. It is of reinforced concrete construction, has steel sash and a built-up roof. The office building, which is 40 per cent completed, is 42 feet wide and 112 feet long. The plant site area is approximately 20,000 square feet.

To Sell Excess Styrene

As a means of averting an impending shortage of monomeric styrene in this country, the Office of Rubber Reserve, Reconstruction Finance Corporation, has made available to private industry such quantities of monomeric styrene as may be produced in excess of the requirements of the government's synthetic rubber program. Sales will be made only in tank car lots at the established market price of 13c per pound, f.o.b. the government producing plant nearest the point of delivery. The arrangements whereby government-produced monomeric styrene will be sold to consumers outside of the synthetic rubber industry is a temporary one, and will end as soon as private industry can supply consumer demands.

OBITUARIES

Kenneth E. Burgess

Kenneth E. Burgess, director of technical research for the Magnetic Pigment Division of the Columbian Carbon Co., New York 17, N. Y., died at the Presbyterian Hospital, Philadelphia, Penna., on February 10 at the age of 56. Born in Burgessville, Ontario, Canada, he received a graduate and post graduate degree in chemistry at the University of Toronto, Toronto, Canada. Before joining Columbian Carbon he worked for the E. I. du Pont de Nemours & Co., Inc., on the production of explosives, the Zapon Division of the Atlas Powder Co. on the development and manufacture of protective coating, and the Van Schaack Chemical Co. In 1944 Mr. Burgess became director of the technical research program for the Magnetic Pigment Division. During World War II he was active in the development of federal pigment specifications for camouflage and other military purposes. He was a member of the American Institute of Chemical Engineers, the American Institue of Chemists, the American Chemical Society and the Chemists Club. He was also a member of the Trenton Country Club. He is survived by his widow, a daughter and son.

Frederick W. Strong

Frederick W. Strong, formerly general manager of distributing branches of the U. S. Rubber Co., died at his home in Kew Gardens, Long Island, N. Y., on February 13, after a short illness. He was 59 years old. He had been associated with the U. S. Rubber Co. for 44 years. In November, 1945, he asked to be relieved of active duty because of poor health and since that time had been acting in an advisory capacity to the manager of distributing branches. Mr. Strong was born in Brooklyn, N. Y., on July 1, 1886. He started work with U. S. Rubber in 1902 as a travelling auditor. In 1923 he became assistant financial manager of sales with headquarters in New York City and two years later was made financial manager of sales. In 1929 he was appointed assistant general manager of distributing branches and in 1934 was made general manager of distributing branches. A widow and daughter survive.

Herman A. Everlien

Herman A. Everlien, general sales manager of the mechanical goods division of the U. S. Rubber Co. died suddenly of a cerebral hemorrhage on February 21 at his home in New York City. Mr. Everlien had been associated with the rubber industry for 43 years. He began his career as a clerk in the Chicago office of the Revere Rubber Co., a firm later consolidated into the U. S. Rubber organization. He rose through various clerical and sales positions to become mechanical goods sales manager of the Pittsburgh district in 1920. Four years later he was transferred to the company's general offices in New York to take charge of mechanical goods branch sales, and in 1944 he was appointed general sales manager of this division. A widow survives.

Donald Blair Lowe

Dr. Donald Blair Lowe, medical director of the B. F. Goodrich Co., Akron, for 31 years, died on March 2, following a brief illness, at the age of 62. Born in Kingsville, Ohio, on August 1, 1883, Dr. Lowe was graduated from Adelbert College and the Medical School of Western Reserve University, Cleveland, Ohio, receiving his medical degree in 1912. After post-graduate work at Johns Hopkins, Baltimore, Md., an internship at several hospitals in Cleveland, and a year as an instructor of medicine at Western Reserve, he was named medical director of Goodrich in August, 1915. He is survived by a widow, a son and a daughter.

Dr. T. A. Tengwall

Dr. T. A. Tengwall, associated for the past two years as advisor on rubber of the Board for the Netherlands Indies, Surinam and Curacao, died on January 19. Much of Dr. Tengwall's work was carried on abroad. He was associated with the Institute for Tropical Agriculture in Antalya, Turkey, as a director; as a vice director of the Experiment Station at Buitenzorg, West Java; and as Director of the Research Department of the Firestone Plantation Co. in Liberia.

General Reorganizes Department

To streamline the increasing activities of its truck tire department, the General Tire & Rubber Co., Akron, has reorganized the key personnel in that branch. The truck tire department will now operate with F. D. Gillen handling sales of all products to motor truck, trailer, airplane, and industrial equipment manufacturers; F. R. Eyer, managing national account sales; Paul E. Shobert, heading aviation product sales; C. G. Meyers, as manager of mileage sales; A. G. Maranville, in charge of engineering of pneumatic industrial tires and wheels; and Robert Moran, as coordinator of Akron and field operations.

Conciliation Office for Industry

The first office of the Conciliation Service of the U. S. Department of Labor to be devoted solely to the labor relations problems of one industry has been opened in the Buckeye Building, Akron, Ohio, to service the rubber industry. Paul W. Fuller, the Commissioner of Conciliation who has been assigned to the rubber industry for the last four years, will be in charge of the office. He will be assisted by Claude Wisdom and George Morrison. Mr. Fuller has been a Commissioner of Conciliation for six years, handling assignments in rubber, textile and coal strikes, while Mr. Wisdom has been field representative in Akron for the United Rubber Workers of America (CIO). Incidentally, a brochure, "What is the Conciliation Service," has been issued by the Department of Labor and is available without cost. In addition to a descriptive summary of the Conciliation Service, the brochure lists U. S. Conciliation Service officers throughout the country.

Ontario Group Hears Ball

Approximately 65 members and guests attending the meeting of the Ontario Rubber Section of the Chemical Institute of Canada, held at the Chemistry Building of the University of Toronto, Toronto, Canada, on February 21, heard J. M. Ball, Eastern representative of the Midwest Rubber Reclaiming Co., East St. Louis, Ill., deliver a talk on "Reclaimed Rubber During Reconversion." The paper for the talk was prepared by Mr. Ball and R. L. Randall. Mr. Ball discussed and graphically illustrated the composition of tire scrap for future use, showing the change in ratio of synthetic to natural rubber used in truck and passenger tires, and also the change in volume of recapped passenger and truck tires from 1940 onward. He described the laboratory work covering various reclaims and their test results. Slides were shown to further illustrate the subject.

Quebec Group Hears Elliott

Dr. Lloyd G. Elliott, of the National Research Council, Ottawa, Canada, was the principal speaker at a meeting held by the Quebec Rubber and Plastics Group at the Ritz-Carlton Hotel in Montreal, Canada, on February 8. Dr. Elliott discussed "The Release of Atomic Energy," and stated that government subsidy of scientific research is the only means by which Canada may continue in her present important position in the era of new and scientific developments born out of the war. After voicing his sincere hope that the atomic bomb had seen its last application with the subjugation of Japan, Dr. Elliott discussed the present and future applications of the fission of the atom in the fields of chemistry, biology and medicine. The address was followed by a question and answer period.

CANADIAN NEWS

Monsanto (Canada) Ltd. has under construction a polystyrene plant, the output of which is expected to greatly exceed Canada's prewar requirements for the widely-used thermoplastic material. The new plant is expected to be in production sometime this year and a considerable portion of the output will be available for export to foreign markets. Processes and techniques established at Springfield, Mass., by Monsanto's Plastics Divisions will be used at the new plant, which will be located in the Montreal area. The styrene monomer will be purchased from the crown-owned Polymer Corporation at Sarnia, Ontario.

All restrictions on the purchase and use of Butyl Rubber were lifted by the Department of Munitions and Supply on March 1. In announcing the decision, Rubber Controller J. A. Martin pointed out that laboratory and road tests have indicated that inner tubes made of Butyl tear less easily and retain air longer than those made with natural rubber.

Canada is exporting small quantities of synthetic rubber, according to Hon. H. C. Howe, Minister of Reconstruction, but almost all of the output by the Polymer Corporation at Sarnia, Ontario, is required for domestic purposes. Mr. Howe predicted that it would be approximately two years before the supply of natural rubber returned to normal.

Several executive appointments have been announced by the Goodyear Tire & Rubber Company of Canada, Ltd., Montreal. A. W. Denny has been named vice-president in charge of production, with R. W. Richards, vice-president in charge of sales; O. H. Barrett, assistant to the president; D. C. Carlisle, treasurer; K. E. Kennedy, secretary; and H. A. Tipple, comptroller.

A. H. Newman has resigned as director-general of publicity for the Department of Munitions and Supply and has been appointed manager of public relations for the Polymer Corp., Ltd., at Sarnia, Ontario. Mr. Newman joined the Department in November, 1941, and was appointed director in the autumn of 1944.

An official of the Wartime Prices and Trade Board has hotly denied a report of a New York daily newspaper, which charged that a stock of pre-war tires had been hoarded in Canada and that leading United States rubber magnates had been offered the tires at "inflationary prices." One American manufacturer was reported to have been offered 8,700,000 tires.

The Board official pointed out that the newspaper probably had mistaken the huge stock piles of thousands of old tires salvaged during the war and kept in eastern Canadian cities as new pre-war tires. The piles belonged to a special salvage organization established by the government for war purposes, he said, and they were sold to scrap dealers when the government-owned company was disbanded two months ago.

Naugatuck Chemical Division of the Dominion Rubber Co., Ltd., recently announced the promotion of Dr. Harry Wintsch from production superintendent to assistant manager of the Division. At the same time it was announced that Charles W. Gates has been named manager of the Division's recently-created Development Department, and that E. M. Quinlan will be production manager.

A net profit of $246,772 for the year of 1945, which is equal to $1.25 a share of common stock and which compares with $169,033 for 1944, has been reported by the Dunlop Tire & Rubber Goods Co., Ltd.,, Toronto, Ontario. In making the report, James Simpson, president and general manager, pointed out that although sales in 1945 were somewhat greater than in the previous year, the major factor in the improvement in operating profit was the replacement by commercial business of a substantial portion of the direct war output which had been produced for the government at prices yielding only a nominal margin over cost.

An increase of 11.7% over the previous year's figure brought sales of the B. F. Goodrich Rubber Co. of Canada, Ltd., to the highest point in its history in 1945, stockholders of the company were recently informed by George W. Sawin, president. He also revealed that investments in new buildings, equipment and repairs during the year reached a total of $1,047,751, and that the company is committed to an additional expansion of $870,000. Tax payments for 1945 totaled $1,764,761.

K. W. Atkinson, who has been associated with the Dominion Rubber Co., Ltd., Montreal, since 1939, has been appointed general auditor of the company. During the war, Mr. Atkinson was on loan to the Automotive Production Branch of the Department of Munitions and Supply, at Ottawa, and was comptroller and assistant treasurer of Dominion Rubber Munitions, Three Rivers, operated by Dominion Rubber for the government.

A new development in women's rubber footwear, known as "Hosavers," has been developed by a footwear plant in Kitchener, Ontario. The invention, in the form of a heel flap, prevents soiling or splashing of the back of hose on wet days.

At the opening session of the first postwar conference of the Tire Division of the Dominion Rubber Co., held recently at the Granite Club in Kitchener. A. W. Hopton, vice-president of the Division, declared that the shortage of passenger car tires is expected to extend well into the year, although the truck tire situation will be better. Mr. Hopton who was introduced by J. A. Lucas, general sales manager and chairman of the conference, cited shortages of materials and factors beyond the control of the industry as obstacles hindering manufacturers in their efforts to meet the tremendous demand for tire casings.

At the annual shareholders meeting of the Seiberling Rubber Company of Canada, Ltd., held in Montreal recently, Marcus L. Brown, president, disclosed that the net working assets of the company at the end of 1945 were $500,000, compared with $250,000 on October 31, 1939. J. Penfield Seiberling, president of the parent organization at Akron, also addressed the meeting.

Goodyear Tire & Rubber Company of Canada, Ltd., reports a net profit for 1945 of $1,385,959, which is equal to $4.30 a share of common stock, and compares with a net of $1,352,000, or $4.14 a common share for the previous year. Net expenditures during the year for additions to buildings and equipment amounted to $1,461,623.

New Rubber Heel Company

The Rubber Heel Company of America, Inc., with office and factory at 6700 Third Avenue, Brooklyn 20, N. Y., and sales and showroom at 28 Beekman St., New York 7, N. Y., was recently organized. The new company has taken over the equipment and assets of the Rubber Heel Company of America, formerly located in Astoria, L. I., N. Y. Louis Goldstein is president and Murray B. Palmer, vice-president, of the new organization, which plans on manufacturing a general line of molded goods in addition to heels and soles.

Organizes British Company

British Geon, Ltd., has been organized by the B. F. Goodrich Chemical Co., Cleveland, Ohio, and the Distillers Co., Ltd., of England, for the manufacture and sale of plastic materials and copolymers in the United Kingdom. The company will have a capitalization of £500,000. Chairman of the board of the new company is Sir Walrond Sinclair, who is also chairman of the board of the British Tire & Rubber Co., Ltd., and a director of the B. F. Goodrich Chemical Co.

If you own a Scott Tester, pass this ad along to your Maintenance Man. Complete set of previous Data Sheets will be sent you free upon request.

MAINTENANCE DATA SHEET NO. 2

CALIBRATION OF SCOTT TESTERS (Con.)

If a high reading results from checking the recording head (per Data Sheet No. 1), there are 3 causes: 1. On earlier testers, the weight—held by a set screw—may have been raised closer to the pivot of the pendulum. 2. Mass may have been removed from the weights. 3. The weight may have been removed and put back on the pendulum upside down.

If a high reading cannot be corrected by adjusting the position of the weight, it is advisable to send the head of the tester to the manufacturer for recalibration.

Usually any error found in calibrating is a low reading, generally caused by undue friction within the head mechanism. First check the bearings holding the head shaft. These are lubricated with a special grease, in which dirt and lint may accumulate after years of service. To clean, remove bearings from the head and wash carefully in gasoline or commercial solvent. After washing, cup the bearing in the palm of the left hand so that the inner race does not rub against the skin; place the right thumb against the inner race with moderate pressure, revolving it slowly. Any particles of rust or foreign matter can thus be felt. To produce a good calibration, the bearings must be entirely clean of any material that would impair free rotation.

After cleaning, lubricate the bearing with a very small amount of white vaseline. Never use gear lubricants or machine oil, which tend to oxidize upon exposure.

The many Scott Testers supply the needs of testing textiles, rubber, wire, paper, etc., up to 1 ton tensile.

REQUEST "CATALOG & DATA BOOK NO. 45"

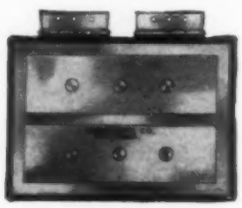
SCOTT TESTERS, INC.

85 Blackstone St., Providence, R. I.

NEW EQUIPMENT

Non-Electric Stainless Steel Magnet

The development of a powerful, compact, non-electric magnetic separator with a working surface made entirely of stainless steel, has been announced by the Eriez Manufacturing Co., Erie, Penna. An idea of the new unit can be secured from the accompanying illustration which shows the edge strips and center in-



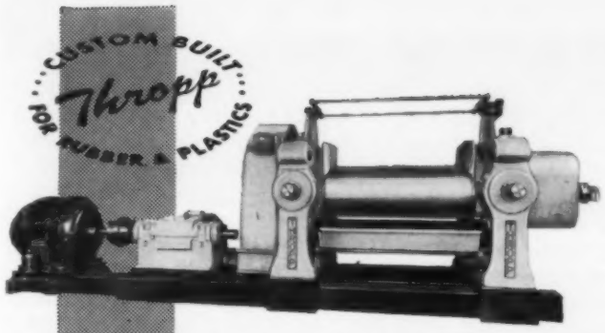
sulating strip of non-magnetic stainless steel to prevent strength of the unit from magnetizing the steel on which it is mounted. The two "pulling" areas on each side of the center insulating strip are made of magnetic stainless steel. The unit needs no wiring, power being furnished by Alnico steel magnet castings.

According to Eriez engineers, development of the new unit is of particular interest to the rubber industry, since magnetic equipment of this type offers a simple and efficient means of removing, before fabrication, the occasional piece of stray iron that remains in the pulverizing material before screens and other expensive processing equipment can be damaged. The Eriez magnet can be simply designed and installed in all types of machines requiring magnetic protection and units can be built any size to fit existing or new conveying equipment. Many of these magnets are installed ahead of dies to eliminate the danger of pieces of metal passing into the dies, seriously damaging or destroying them.

New Standardized Lift Truck

The development of a new standardized lift truck, called Load-Lift, has been announced by the Market Forge Co., Everett, Mass. The new unit features many new and exclusive operational devices which increase lift truck efficiency, plus several safety features. In keeping with the standardization program of the manufacturer, the Load-Lift is limited to two capacities of 3,000 and 5,000 pounds, which fills the requirements of hand-operated trucks in the materials handling field. Utilizing the hydraulic principle in lifting, the unit is equipped with sealed ball bearings in the wheels, which means life-time lubrication. All-steel wheels are used instead of the customary cast iron wheels, although plastic wheels and rubber wheels are available on request.

An interesting feature of the lifting mechanism, and another reason for its efficiency, is the fact that each stroke is a power stroke. There is no lost motion, and no ineffective backstrokes. The platform remains stationary at any height. Where floors are smooth and



New Hi-Speed MILLS

22″ & 22″ x 60″ Extra Heavy Duty

Extra Heavy Duty Individual Motor Driven Mill with 15″ diameter journals, having 150 H.P. enclosed herringbone gear drive. Machine is equipped with solid bronze lined bearings having oil closure seals on side of the boxes facing the rolls to prevent oil contamination of the stock. Steel cut connecting gears and Johnson Rotary Joints. Manzel mechanical lubricator and new style guides bored to fit the rolls. This is just one of the many new Thropp precision built mills designed to speed up post war production.

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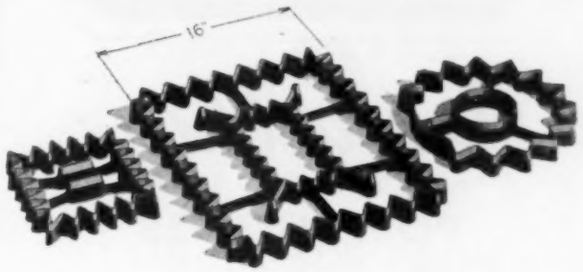

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Normal Shrinkage

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Flexing Equal to Pine Tar

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free from obstruction, the skid platform legs need only be elevated a fraction of an inch to allow the load to be moved. When obstructions are encountered, a few strokes on the lifting lever will allow the truck to negotiate. Lowering is accomplished through means of a small accesible lever which controls the speed.

In the past, many accidents have occurred to operators due to the fact that the pulling handle was an

integral part of the lifting mechanism. In the Load-Lift the lifting handle has been divorced from the lifting mechanism, thus eliminating the possibility of accidents. Every precaution has been taken to seal the hydraulic mechanism from foreign matter, and to protect the truck from injury itself by the use of an overload safety valve. This safety valve allows a 20% overload, but comes into play when this is exceeded, thus preventing serious accident to the truck.

Deublin Rotating Water Joint

The Deublin Union, a new type rotating water joint, for cooling revolving shafts, cylinders, or drums, has been announced by the Deublin Company, Northbrook, Illinois. The union will also efficiently handle liquids for heating up to 200°F. Leakproof, corrosion-proof, frictionless, and more sturdy, the unit utilizes a helical groove on the rotor which runs counter to the direction of rotation. The sweeping action of the helix prevents leakage between the shaft and housing as well as keeping foreign objects from lodging between the two surfaces. Precision machining leaves maximum clearance between the shaft and housing of .0005". Rotor concentricity is held to .001" total indicator reading.

The rotor is machined of stainless steel which provides over three times the tensile strength of cast shafts, while the housing is of bronze. Both rotor and housing resist the corrosive action of water, brine, and other similar liquids that may be used for cooling or heating. Standard, sealed, "lubricated-for-life" ball bearing provides almost frictionless freedom of movement. Wobble is eliminated by special tooling of threads which are concentric in relation to bearing surfaces.

The Deublin Union is made in two types: Monoflow and Duoflow. Four standard sizes are available in both types, but because of the basic design of the union, any size can be manufactured from ¼" pipe size to 6".

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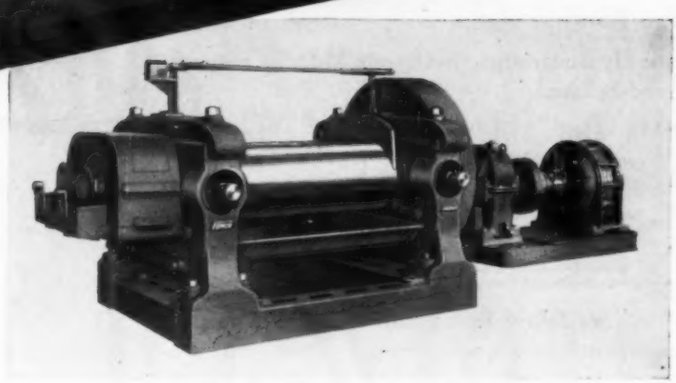

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Color: Tan-Brown.

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Available in 350-pound Fiberpaks.

Inquiries from rubber fabricators, manufacturers of paints and varnishes, and others are welcomed.

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Adjustable Hole-Cutting Tool

Bruno Tools, Beverly Hills, Calif., have developed a new all-purpose adjustable hole-cutting tool which quickly cuts smooth holes in hard rubber, wood, steel, brass, aluminum, fibre, plastics, and problem materials in general which might necesitate use of torches or other equipment. Two sizes of the new cutter are available, each equipped with an easily re-sharpened high-speed steel blade. One model cuts holes to any diameter from 5/8 inch to 1¼ inch through 1/8 inch thickness. The other model covers all expansions from 1 to 2½ inches through thicknesses up to 3/8 inch. The tools are designed to operate in light drill presses, portable drills, or breast drills and are also available with square shanks for use in hand braces.

The Bruno Adjustable Hole Cutter is designed on a new principle which permits easy, yet extremely accurate adjustment. It consists of a drill which starts the hole and also serves as a pilot for the tool, a hardened body with a milled slot into which is set a specially-ground High Speed steel tool bit, and a hardened and ground shank. Adjustment is obtained by loosening the hexagon bolt which holds a firm locking clip, and sliding the blade to the correct distance from the pilot. Thickness capacity of the tool varies with the type of material being worked. Metals up to 3/8 inch thickness are cut quickly and smoothly. Wood, plastics, and compressed materials may be cut to much greater thicknesses.

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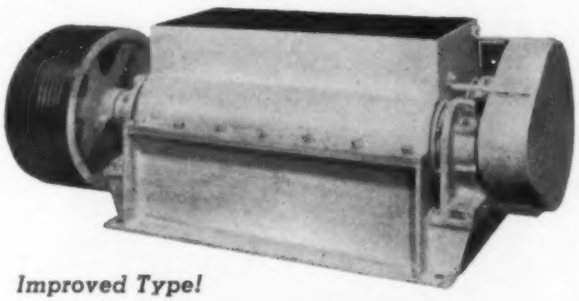

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View of the new Vulmaster

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—Orvus permits articles to leave molds readily; molds clean easily.

—Orvus is effective in hardest water.

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—Orvus cleans thoroughly such articles as inner tubes, automotive parts and other molded and extruded rubber goods. Leaves articles with a pleasing finish.

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ORVUS is a sulfated alcohol type cleanser—not a soap.

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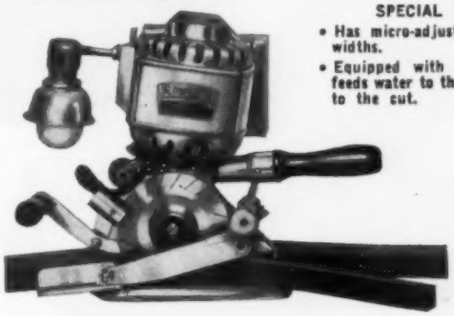
RUBBER STRIP CUTTER

PATENTED

A PORTABLE machine capable of stripping slab rubber up to 1″ thick at the rate of 20,000 feet in 8 hours. Any width desired.



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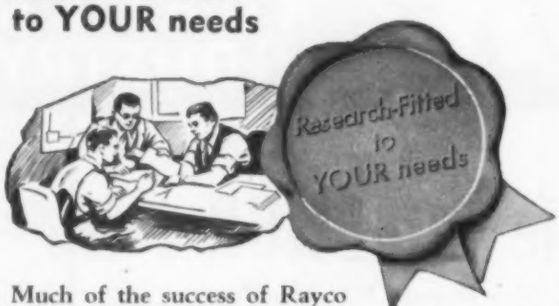

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Developers and Producers of Cotton Fillers for Plastics

REVIEWS

BOOKS

Chemical Constituents of Petroleum. By A. N. Sachanen. Published by Reinhold Publishing Corp., 330 West 42nd St., New York 18, N. Y. 6 x 9 in. 450 pp. $8.50.

This book represents an exhaustive study of the basic chemistry of petroleum, including the most recent findings on this complex subject. A considerable part of the book is confined to individual hydrocarbons and compounds, which have been separated from petroleum, as well as to the methods of separation and identification. Data on the content of various types of hydrocarbons and other constituents, expressed in the terms of ring analysis and of conventional classes, together with the methods for determining the structures and classes, make up a large part of the volume. There are 10 chapters in all, with extensive literature references supplied at the end of each chapter. A short section on the derivation of synthetic rubber from petroleum-based butadiene is included in the chapter on "Hydrocarbons of Synthetic Distillates." Author and subject indexes are included.

•

Organic Preparations. By Conrad Weygand. Published by Interscience Publishers, Inc., 215 Fourth Ave., New York 3, N. Y. 6 x 9 in. 534 pp. $6.00.

This is a translation of Part II, "Reaktionen," of the author's "Organisch-chemische Experimentierkunst," originally published in Leipzig in 1938, the translation being made and published with the consent of the Alien Property Custodian. It treats with laboratory procedure in organic chemistry as an experimental art and traces the course of laboratory work from the construction of apparatus through analysis and physical identification. Subjects covered include the formation of carbon-hydrogen, carbon-halogen, carbon-oxygen, and carbon-carbon bonds; cleavage of carbon-oxygen and carbon-nitrogen bonds; formation of organic derivatives of trivalent nitrogen and of carbon-pentavalent nitrogen linkages; carbon-divalent and carbon-hexavalent sulfur bonds; fission of carbon-carbon bonds; and rearrangements of carbon compounds with the exception of steric rearrangements. A subject index is included.

•

Glycerin: Its Industrial and Commercial Applications. By Georgia Leffingwell and Milton A. Lesser. Published by Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. 5½ x 8¾ in. 260 pp. $5.00.

Based on a comprehensive survey of recent patent literature and reported research findings, this book presents a digested and indicative review of actual and potential glycerin uses in a variety of industrial fields, including rubber. No effort has been made to discuss at length the technical methods of glycerin production as such, but only the physical and chemical properties of the product are described in reference to its industrial and commercial utilization. Each chapter covers the use of glycerin in a particular branch of industry, and contains a discussion of the properties of the material which render it useful for the industry covered.

•

Poly-Pale Resin. Naval Stores Dept., Hercules Powder Co., Wilmington, Del. 8½ x 11 in. 8 pp.

The physical and chemical properties, color grades and applications of Poly-pale resin, the polymerized rosin featured by Hercules Powder for the paint and varnish industry, and which is finding use in numerous other industries, are outlined in this booklet. Included among applications discussed are those in adhesives, in modified maleate and phenolic resins, paper coatings, and linoleum.

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This automatic injection molding machine is your answer for low cost, molded rubber parts with improved physical properties. In actual production, injection capacities as high as eight pounds per cycle have been secured, with curing time and finishing operations reduced to a minimum. For complete information on this revolutionary machine write today for Bulletin 460.

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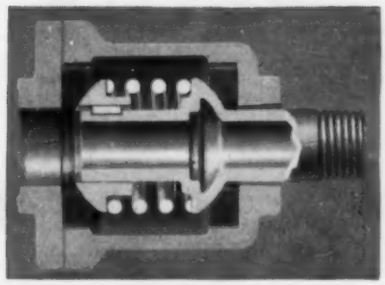

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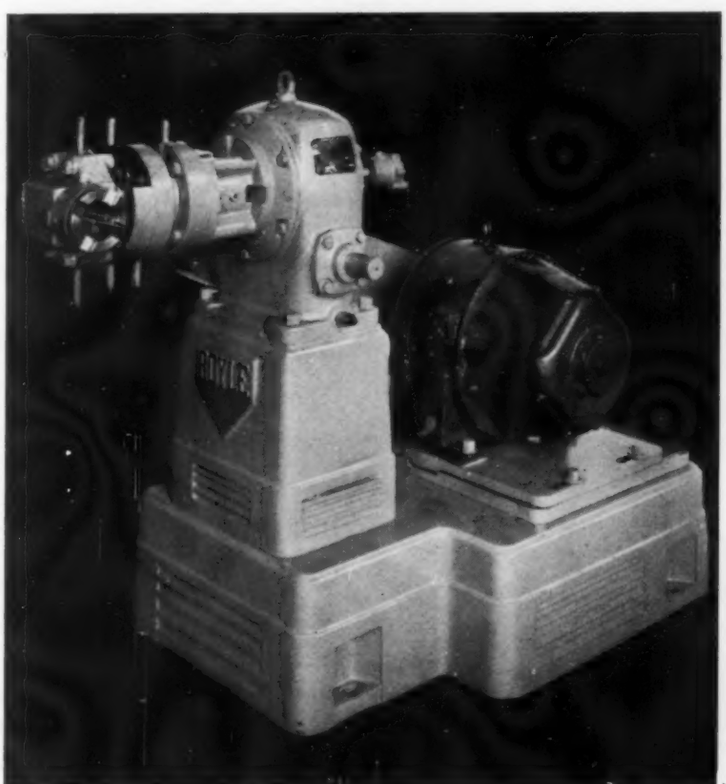

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The Plastics Buyer: 1945-46. Published by Cleworth Publishing Co., Inc., 551 Fifth Ave., New York 17, N. Y. 8 x 11 in. 170 pp. $3.00.

This is the first edition of an annual reference book intended for retail and wholesale buyers of plastics consumer products. It is designed to inform such buyers on the nature of plastics materials, their points of superiority, and their limitations. It contains the first complete list of consumer products which are made entirely or largely of plastics and tells what companies are making them. Technical discussion has been avoided throughout the issue. The edition is divided into several sections, including a general discussion of plastics, a series of plastics classification charts, an index to plastic products, a directory of plastics products and their manufacturers, and an alphabetical list of all manufacturers and addresses. The discussion of plastic materials is subdivided into three major sections, as follows; (1) The Characteristics of Plastics; (2) The Various Plastics Materials; and (3) The Production of Plastics.

BOOKLETS, CATALOGS, Etc.

Special Problems in Bonding and Coating. Angier Products, Inc., 120 Potter St., Cambridge 42, Mass. 8½ x 11 in. 20 pp.

A graphic story of the many ways in which the company's bonding and coating materials have been used in the production of war goods, from combat boots to barrage balloons, is told in this booklet. Information is given on new uses for cements and coatings, formulations, laminants, and laboratory control methods practiced by the company. The basic types of cements and coatings featured by the company for use with leather, rubber, fabric, metal, wood, plastic, paper and glass, are discussed.

Rubber and Synthetic Rubber Products. H. O. Canfield Co., 129 Housatonic Ave., Bridgeport 1, Conn. 8½ x 11 in. 16 pp.

This general catalog is designed to show the range and the variety of rubber and synthetic rubber parts manufactured by the company. Hundreds of molded and extruded parts for all types of industry are illustrated with tabulated lists of some parts for specific fields included. A brief history of the company, which was organized in Bridgeport, Conn., in 1904, is given.

FOR GOOD ABRASION RESISTANCE USE PHILBLACK A

FOR FURTHER DETAILS, SEE AD ON PAGE 650

RANDALL & STICKNEY

Hand Grip Rubber Gauge No. 3-B

Height .....9"	Length .....9¾"	Range .....½"
Depth of Throat ....6½"	Dial 50 Divisions Each Div. 1/1000"	Weight .... 4 lbs. Frame . Aluminum

Designed for gauging stock as it is coming from the calender.

FRANK E. RANDALL, Waltham, Mass.

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MOLD LUBRICANT

An *entirely new* and *different product*

Keeps molds cleaner longer—Gives greater lustre to finished parts. Send for a Free sample and compare it in your own way. Many large companies are obtaining phenomenal results, and are using it *exclusively*.

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Softens Rubber—cured and uncured. Salvage metal from rejects. Cleans screens, valves, molds, and has many other uses.

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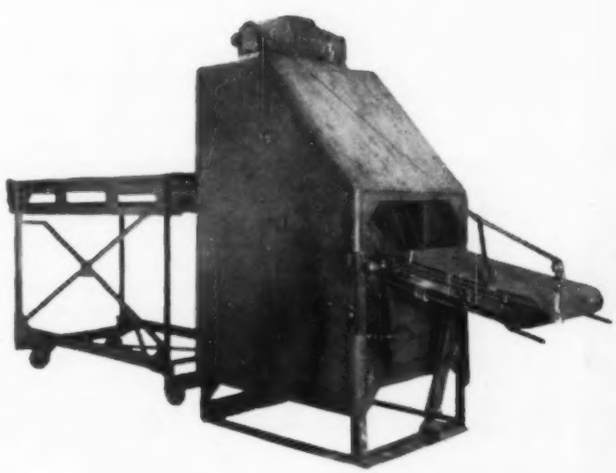

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Write Today for Full Particulars

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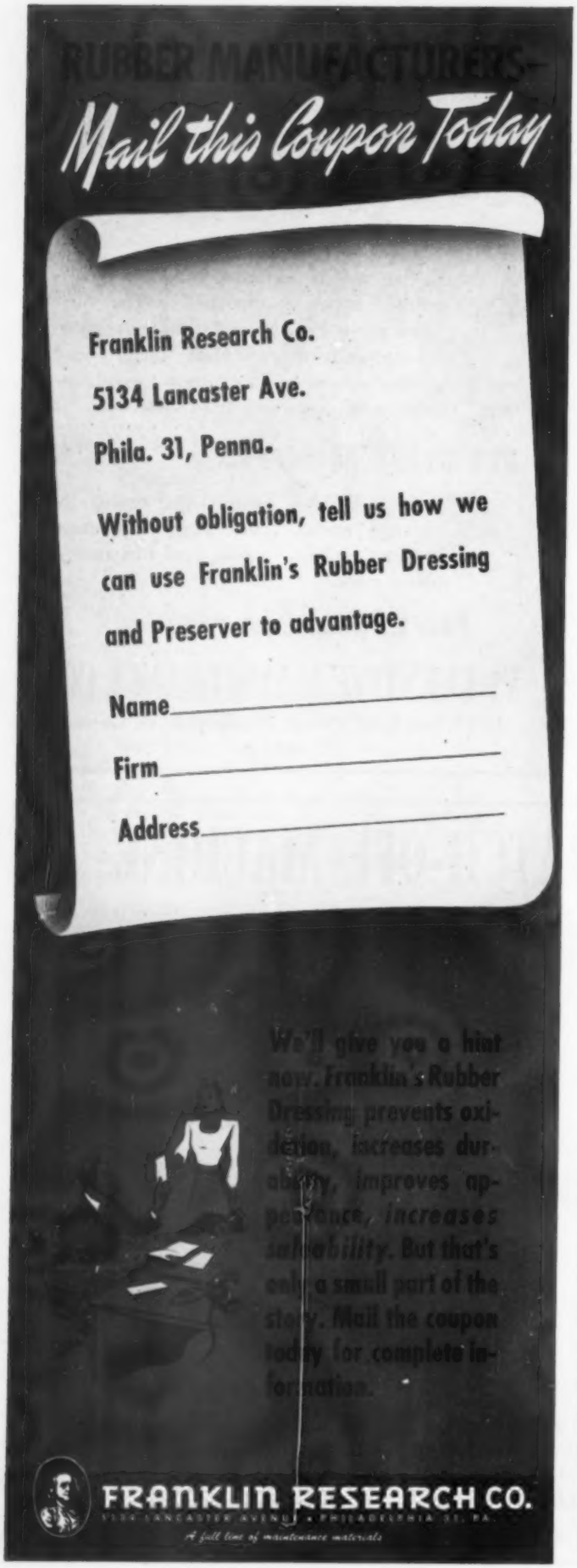
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REVIEWS (CONT'D)

Hevea Rubber Culture in Latin America. By R. D. Rands. Issued by the Chronica Botanica Co., Waltham, Mass. 8 x 10½ in. 28 pp.

A revision of a series of three articles which appeared last year in the *India Rubber World*, and was subsequently reprinted in *Plants and Plant Science in Latin America*, this booklet presents some details of procedure in fostering the rubber growing industry in Latin America and a discussion of problems under investigation in the cooperative intergovernmental program outlined in 1941 by E. W. Brandes. The numerous problems involved in successful rubber cultivation are covered, including economical size of plantations in relation to costs and to other crops, choice of planting material, land clearing methods, soil conservation, planting, intercropping, disease control, development of resistance clones, and labor. A discussion of the work being done at some of the experimental stations established in Latin America is also included.

•

Dillon Universal Tester. (Bulletin No. 142). W. C. Dillon & Co., Inc., 5410 W. Harrison St., Chicago 44, Ill. 8½ x 11 in. 8 pp.

The company's instrument for precision testing of rubber, plastics, wood, metals and glass is covered in detail in this catalog. Among the interchangeable parts of the tester that are discussed are the following: the special gripping jaws for testing the tensile strength of specimens with round, flat, and odd shapes; the compression cage for testing compression of loads up to 10,000 lbs.; the traverse testing fixture for aligning and centering specimens; and the seven interchangeable dynamometers. Simple instructions for operating the tester are also included.

•

Fifty Years of Pioneering. Johnson Rubber Co., Middlefield, Ohio. 9¼ x 7½ in. 88 pp.

This booklet, issued by the company on its 50th anniversary, describes the evolution of the concern from a wooden barrel stave and heading factory in 1895 to its present form today. Written in six chapters by Hugh G. Johnson, chairman of the board, it is an intimate narrative of the rise of the Johnson family in Middlefield and the conversion of the company from the manufacture of wooden products to steel and finally to rubber. Included in the booklet are photographs and brief biographies of the concern's founders and executives.

•

Alcohols. Carbide & Carbon Chemicals Corp., 30 E. 42nd St., New York 17, N. Y. 8½ x 11 in. 32 pp.

One of a series of booklets about organic chemical groups, this booklet contains complete information about 15 synthetic alcohols produced by the company. The booklet lists properties, specifications, shipping data, and information about the uses of alcohol, as well as graphs showing the variation of important properties with respect to temperature, their properties in aqueous solutions, evaporation rates, and solvent power in combination with other solvents. A compilation of constant boiling mixtures and a bibliography are included.

•

Looking into the Sun. Sun Rubber Co., Barberton, Ohio. 8½ x 11 in. 32 pp.

This brochure outlines the plans of the company for reconversion to peacetime production and answers many questions about rubber toys, office supplies, athletic goods and miscellaneous molded rubber products. Profusely illustrated, the booklet describes how Sunruco products were replaced on the production lines in 1941 by war materials. A section of the brochure is devoted to the famous Walt Disney cartoon characters to be created in rubber by the company.

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Baker supplies what neoprene compounders demand—Calcined Magnesia that is always uniform.

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EXTRA LIGHT The Original Neoprene Type
A supreme quality product for the rubber trade. Extremely fine state of division. Improves storage stability and resistance to scorching. A curing agent unexcelled for increased modulus, greater resilience, reduced heat build-up, lower compression set and retention of tensile strength during heat service.

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HEAVY All types can be furnished. Specially ground to meet the exacting Code Pigment Specifications of the Rubber Trade. Unground types for chemical uses.

PACKAGES Specially designed to protect contents from moisture and air. Corrugated carton with special water-proof liner, and inner paper liner. Five-ply multi-wall bag, including asphalt liner.

Special Service for All Requirements of the Rubber Trade

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BUFFALO—Commercial Chemicals, Inc.
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LOS ANGELES—The C. P. Hall Co. of California
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PORTLAND, ORE.—Miller & Zehrung Chemical Co.
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TRENTON, N. J.—General Supply & Chemical Co.

VULCANIZED VEGETABLE OILS

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Types, grades and blends for every purpose, wherever Vulcanized Vegetable Oils can be used in production of Rubber Goods—be they Synthetic, Natural, or Reclaimed.

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A LONG ESTABLISHED AND PROVEN PRODUCT

THE CARTER BELL MFG. CO.
SINCE
CARTER BELL PRODUCTS
1903
SPRINGFIELD, NEW JERSEY

Custombuilt Latex and Resin Compounds. General Latex & Chemical Corp., 666 Main St., Cambridge, Mass. 8½ x 11 in. 16 pp.

This booklet, divided into several compact sections, describes the company's pioneering work in the introduction of natural rubber latex and discusses the sources and development of that material for the rubber and other industries. Some information on the part played by the company in the operation of the government-owned synthetic rubber plant at Baytown, Texas, is given. The composition of some of the synthetic latices and some of the synthetic resins is shown and the properties and characteristics of these materials briefly discussed. A tabulated list of some of the industrial applications of latex is included. Some of the research facilities maintained by the company are portrayed.

•

H-P-M All-Hydraulic Presses for Modern Pressure Proccessing (Bulletin No. 4500). Hydraulic Press Mfg. Co., Mount Gilead, Ohio. 7¾ x 10½ in. 84 pp.

Well written and extensively illustrated, this booklet describes the various types of hydraulic presses manufactured by the company, from the one-ton all-hydraulic machine designed for pressing bushings into automobile engine pistons to the 5,000-ton HPM. Fastraverse rubber pad forming press used by metal aircraft manufacturers. It contains information on hydraulic presses used for forming and drawing, forging, and die-casting; hydraulic presses used in the plastics and process industries; and shop presses used for shaft straightening, bending, riveting, and scrap metal baling. In addition it presents a history of hydraulic presses from 1890 to 1945.

•

Vinylite Plastics: Elastomeric Compounds. Bakelite Corporation, 300 Madison Ave., New York 17, N. Y. 8½ x 11 in. 24 pp.

The numerous applications of some of the Vinylite elastomeric compounds are described and illustrated in this well-prepared booklet. The various compounds are first described and then the specific application of molding compounds, extrusion compounds, flexible sheeting and film compounds, and cloth-coating resin compounds are discussed. The average properties of typical Vinylite compounds for molding, extrusion, sheeting and film purposes, are shown in two tables, with data covering hardness, tensile strength, elongation, stiffness, brittleness, tear resistance, water absorption, flammability, and dielectric strength.

REMOVE THE NERVE WITH PHILBLACK A

FOR FURTHER DETAILS, SEE AD ON PAGE 650

Utility Crimper Type Flipper
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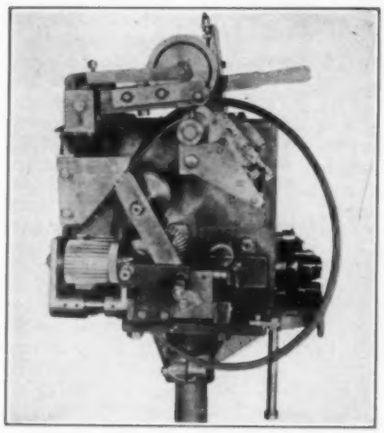

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High Frequency Dielectric Heating can speed up and improve your thick section curing problems either by preheating or by use of its full advantage in the actual pressing cycle!

Specializing in engineering for the application of High Frequency Heating to the Rubber Industry . . . . .

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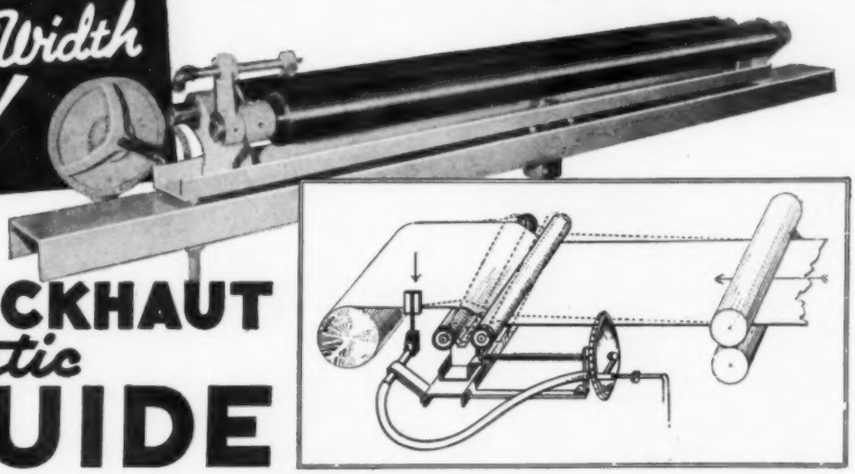

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"Slack edge" troubles aggravated by increasing the width of goods in calendering are being completely overcome through installations of this highly efficient WALDRON-DICKHAUT Web Guide. Automatic Tensioning feature eliminates the variations that result from manually controlling tensions.

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Main Office & Works – NEW BRUNSWICK, NEW JERSEY
BUILDERS OF QUALITY MACHINES SINCE 1827

MARKETS

Rubber – Crude, Reclaimed and Scrap – Cotton – Ducks – Tire Fabrics – Sheetings

NEW YORK MAR. 13, 1946

Natural Rubber

SOME interesting information on the natural rubber situation was recently revealed by W. J. McNamee, vice-president and director of the Rubber Development Corporation, in testimony made before the House Appropriation Subcommittee. According to that testimony, the United States has obtained about 70,000 tons of natural rubber from Java and Indo-China, and has knowledge of stockpiles in that area of about 220,000 tons. Not all of the rubber obtained has yet arrived in the United States, but preparations for its shipment are being made.

Discussing contracts with Latin American countries under which the United States has been procuring all or almost all of the rubber produced in those countries, Mr. McNamee stated that it would be advantageous from a financial point of view for this country to buy all of its rubber in the Far East, but that it would be definitely disadvantageous to the country to cancel these contracts and break faith with the various Latin American governments concerned. Most of these contracts expire in June of next year and it is doubtful whether any of them will be renewed.

According to a report from the Associated Press from Los Angeles on March 6, the "California Guayule Rubber Project Committee" has announced that the government has plowed under 25,500 of the 31,000 acres of guayule planted in 1942. Only 5,500 acres of guayule still remain under cultivation, the report stated, adding that lack of subsidies make it unprofitable for growers to mill their own guayule plants.

Prices shown below are ceilings set by the Office of Rubber Reserve, Reconstruction Finance Corporation:

	C	N-C
Plantations—		
Ribbed Smoked Sheets, 1X	22½	40
Thick Pale Latex Crepe, 1X	22½	40
Thin Pale Latex Crepe, 1X	22½	40
Thick Brown Crepe, 1X	21⅜	38¼
Thin Brown Crepe, 1X	21¾	38⅞
Thick Remilled Blankets, #1	21⅜	38⅞
Rolled Brown or Flat Bark	18	35½
Smoked Blankets, #1	21⅛	38⅜
Claro Brand 1XRSS	22½	40
Sole Crepe Trimmings	22	39½
Sole Crepe	22½	40
Wild—		
Uncut Fines, Crude	15	29
Cut Fines, Crude	15½	29¾
Cut Fines, Washed & Dried	22½	40
Upriver Coarse, Crude	12⅝	26⅜
Upriver Coarse, Washed & Dried	20¼	37¾
Caucho Ball, Crude	11⅝	24¾
Caucho Ball, Washed & Dried	19½	37
Guayule—		
Carload Lots	17½	31
Less than Carload Lots	18	31½
Balata—		
Surinam Sheet	42½	42½
Manaos Block	38¾	38¾
Colombian Block	38¾	38¾
Peruvian Prime	38¾	38¾
Chicken Wire	23¼	23¼
Latex—		
Normal, Tank Car Lots	26	43½
Creamed, Tank Car Lots	26¾	44¼
Centrifuged, Tank Car Lots	27¾	45¼
Heat-Concentrated, Carload Drums	29½	47

C for Civilian Use; N-C for Non-Civilian Use.

Scrap Rubber

The demand for scrap rubber continues to improve slightly, although the price situation has not improved very much since our last report. The problem of proper segragation of scrap continues to plague the average dealer and it is evident that this problem will assume greater proportions in the near future, as larger quantities of synthetic rubber tires join the salvage heaps. As pointed out in a paper on the reclaiming of synthetic scrap which won second prize in the contest on that subject sponsored by the Chicago Rubber Group, the solution of the problem of reclaiming GR-S is far enough advanced to be classed as not critical, but the much greater problem remaining is that of reclaiming mixtures. The latter problem could be considerably modified by proper segregation methods, and both reclaimers and scrap rubber dealers are giving the subject much attention. Prices shown are ceilings on typical grades of scrap:

(Prices to Consumers, Delivered Akron)

Mixed passenger tires	ton	$20.00
Beadless truck tires	ton	26.00
Mixed truck tires	ton	20.00
Beadless passenger tires	ton	26.00
No. 1 passenger peelings	ton	52.25
No. 1 truck peelings	ton	52.25
No. 2 passenger tubes	lb.	.07¾
Red passenger tubes	lb.	.07½
Black passenger tubes	lb.	.06¾
Mixed passenger tubes	lb.	.06½
No. 2 truck tubes	lb.	.07½
Red truck tubes	lb.	.07¼
Black truck tubes	lb.	.06¾
Buffings	ton	35.00
Bicycle tires	ton	15.00
Air bags and water bags	ton	15.00
Boots and shoes	ton	33.00

Tire Fabrics

The situation in the tire fabric field remains unchanged, with practically no demand for such fabrics. Consequently, prices are nominal and in many quarters are not even being quoted. The prices shown below are those which were in force on or about January 15, 1942.

(Prices Net at the Mill)

Peeler, carded, 23/5/3	lb.	.43½ @	.44
Peeler, carded, 23/4/3	lb.	.44½ @	.45
Peeler, carded, 15/3/3	lb.	.41½ @	.42
Peeler, carded, 15/4/2	lb.	.41½ @	.42
Peeler, carded, 13/3/3	lb.	.40½ @	.41
CHAFERS			
Carded, American, 1 1/16"	lb.	.43½ @	.44
Carded, American, 1"	lb.	.39½ @	.48

Sheetings

48x40	36	in.	5.50	lb.	— @ 8.272
40x40	36	in.	6.15	lb.	— @ 7.398
40x36	36	in.	6.50	lb.	— @ 7.000
48x48	40	in.	2.50	lb.	— @17.200
48x48	40	in.	2.85	lb.	— @15.087
56x60	40	in.	3.60	lb.	— @12.638
48x44	40	in.	3.75	lb.	— @11.733

Note: Prices shown above are ceiling prices set by order of the O.P.A.

Cotton

The price of middling uplands on the Cotton Exchange covered a 110 point range since our last report (February 14), high being 27.64 on March 1 and low 26.54 on February 19. The average price of middling uplands for the month of February was 26.57, based on 21 trading days. Based on the inflationary interpretation given to the government's recently-announced wage-price policy, the price started moving upward in mid-February, with occasional hedge selling and profit taking temporarily halting the climb. Official intimations of higher textile price ceilings, however, served to spark the trend and the price moved up on March 1 to the record 27.64 cent figure. Uncertainty of the government's actual position has caused a nervous market in the past week or so, and this uncertainty, combined with rumors of a price ceiling of about 27 cents on cotton, has resulted in a declining trend, the price falling of to 27.31 today (March 13). The rise in ceiling prices on cotton fabrics recently approved by OPA and the expected fight in Congress against the imposition of ceilings on raw cotton are expected to reverse the downward trend and maintain the price of middling uplands at current or even higher levels. Quotations for middling uplands on the Exchange follow:

	Feb. 14	March 13		
	Close	High	Low	Close
March	25.94	27.17	26.93	27.15
May	26.02	26.82	26.66	26.71
July	26.05	26.87	26.67	26.75

Reclaimed Rubber

The demand for reclaimed rubber continues at the peak levels established in recent months. The settlement of the major automotive and electrical labor difficulties, involving General Motors and General Electric, respectively, is expected to result in still higher demand for reclaim and the industry will be hard put to meet it. Some tightening in the supply of natural rubber scrap has been evident in recent weeks and the day is rapidly approaching when the reclaiming and use of synthetic scrap will reach respectable proportions. Much progress has been made on satisfactory methods of reclaiming synthetic and reclaimers feel they will have no unusual difficulties on this score. Prices below are ceilings on typical grades of reclaim:

Shoe			
Unwashed	lb.	.07½ @	.07¾
Tube			
Black Tube	lb.	.11¾ @	.12
Red Tube	lb.	.12½ @	.12¾
Tires			
Black (acid process)	lb.	.08 @	.08¼
Black, selected tires	lb.	.07 @	.07¼
Truck, Heavy Gravity	lb.	.09 @	.09¼
Miscellaneous			
Mechanical blends	lb.	.05 @	.06
White	lb.	.13½ @	.13¾

Ducks

Enameling (single filling)	lb.	— @	.44¼
Belting and Hose	lb.	— @	.39
Single filling, A grade	lb.	— @	.19¾
Double filling, A grade	lb.	— @	.20¾

ERNEST JACOBY & CO.

Crude Rubber — *Liquid Latex*
Crown Rubber Clay — *Carbon Black*
Rubber Chemicals — *Rubber Colors*

Stocks of above carried at all times

BOSTON - 79 Milk St. - MASS.

Cable Address: Jacobite Boston

MICA

WATERGROUND WHITE and BIOTITE MICAS—Used for over 35 Years in the Rubber Industry

The English Mica Co.
220 E 42nd St., NEW YORK 17

METALLURGICAL SERVICE CO.

PROCESS ENGINEERS — COMMERCIAL HEAT TREATERS — INDIANAPOLIS 2, INDIANA

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WITHOUT AFFECTING THE PHYSICAL PROPERTIES OF METAL INSERTS

* * *

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For RUBBER
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PINE TAR
BURGUNDY PITCH
GALEX a non-oxidizing RESIN

Send for "Pine Tree Products" *Booklet*

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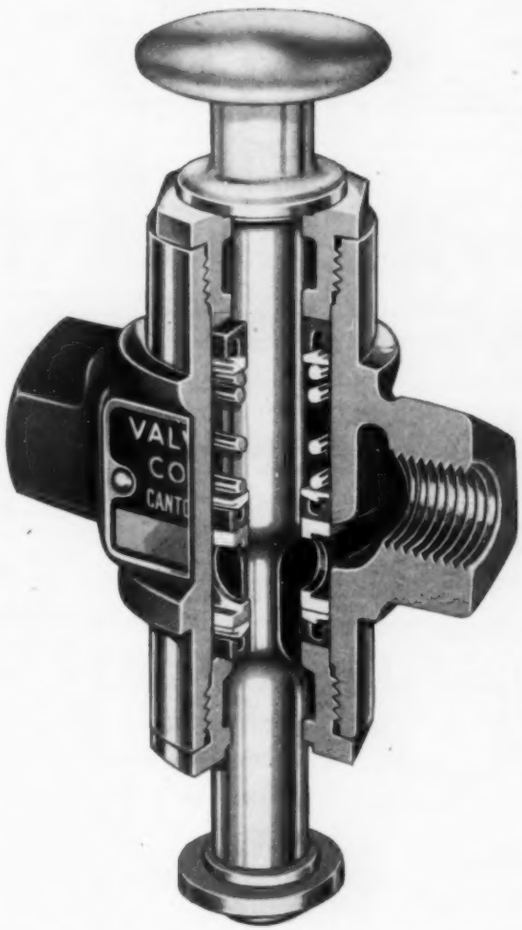
Plant: Savannah, Ga. Branches in Principal Cities
"PIONEERS OF THE INDUSTRY"

VALVAIR

TRADE MARK

AIR CONTROL VALVES



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Valvair valves are new in design and principle, standard valves have been operated more than two million times without leak with air pressure exceeding 100 lbs. They are designed for indefinite life and exceptionally hard service.

They are compact—they do not have metal seals—the body is made of cast bronze and steel parts are made of stainless steel—they will not corrode.

They are made in five sizes—¼, ⅜, ½, ¾ and 1 inch—and in two-way, three-way and four-way types. They can be furnished in eight or more different designs—knob, lever, foot, cam, clevis, single diaphragm, double diaphragm or solenoid operated.

They will control air efficiently up to 200 lbs. pressure with a very light movement. The area through the valves is equivalent to pipe size with minimum pressure drop. Write for literature.

THE SINCLAIR-COLLINS VALVE COMPANY
454 Morgan Avenue
Akron 11, Ohio

CHEMICAL MARKETS

New York, Mar. 13, 1946
All Prices F.O.B. Works

ACCELERATORS

Organic

A-1 (Thiocarbanilid)	lb.	.28	.33
A-10	lb.	.36	.42
A-19	lb.	.52	.58
A-32	lb.	.59	.69
A-77	lb.	.42	.55
A-100	lb.	.42	.55
Aldehyde ammonia, crystals	lb.	.65	.70
Altax	lb.	.39	.41
Beutene	lb.	.59	.64
B-J-F	lb.	.34	.39
Butasan	lb.	—	1.10
Butyl Zimate	lb.	—	1.10
Captax	lb.	.34	.36
Crylene	lb.	.40	.47
Di-Ortho-Tolyguanidine	lb.	.44	.46
Diphenylguanidine	lb.	.35	.41
El-Sixty	lb.	.36	.43
Ethasan	lb.	—	1.10
Ethyl Tuads	lb.	—	1.25
Ethyl Zimate	lb.	—	1.10
Ethylidine aniline	lb.	.42	.43
Formaldehyde aniline	lb.	.31	—
Guantal	lb.	.39	.48
Hepteen	lb.	.34	.39
Hexamethylenetetramine	lb.	.33	—
Lead Oleate, No. 999	lb.	.13	—
Witco	lb.	—	.16½
Ledate	lb.	—	1.20
Methasan	lb.	—	1.20
Methyl Tuads	lb.	—	1.25
Methyl Zimate	lb.	—	1.20
Monex	lb.	—	1.25
Pentex	lb.	.74	.84
Phenex	lb.	.49	.54
Pip-Pip	lb.	—	1.63
R & H 50-D	lb.	.42	.43
R-2 Crystals	lb.	—	1.55
Rotax	lb.	.44	.46
Safex	lb.	1.15	1.25
Santocure	lb.	.60	.67
Selenac	lb.	—	1.60
SPDX-G	lb.	.53	.58
Super-Sulfur No. 2	lb.	.13	.15
Thiocarbanilid, drums	lb.	.28	.33
Thiofide	lb.	.39	.46
Thiotax	lb.	.34	.41
Thiurad	lb.	—	1.25
Trimene	lb.	.54	.64
base	lb.	1.03	1.18
Triphenylguanidine	lb.	.45	—
Ulto	lb.	.99	1.04
Ureka	lb.	.50	.57
Blend B	lb.	.50	.57
Blend C	lb.	.48	.55
Vulcanex	lb.	.42	.43
Vulcanol	lb.	.85	—

Inorganic

Litharge, domestic	lb.	.08	.08½
Magnesia, calcined, heavy	lb.	.08	.12

COLORS

Blues [b]			
Prussian	lb.	.36	—
Ultramarine	lb.	.17	.27
Browns [b]			
Mapico	lb.	.1135	—
Umber, Turkey	lb.	.04¼	—
Greens [b]			
Chrome	lb.	.23	—
Guignet's Green	lb.	.70	—
Reds			
Antimony crimson, 15/17	lb.	—	—
Indian	lb.	.08¾	—
Domestic (Maroon)	lb.	.11	—
Mapico	lb.	.096	—
Red oxide, pure	lb.	.10	.12
Rub-Er-Red	lb.	.09¼	—
Whites [b]			
Cryptone No. 19	lb.	.0560	.0585
Cryptone CB No. 21	lb.	.0560	.0585
Cryptone ZS-800	lb.	.0825	.0850
Lithopone:			
Albalith	lb.	.04¼	.04½
Astrolith	lb.	.04¼	.04½
Axolith	lb.	.04¼	.04½
Ray-cal	lb.	.05½	.05¾
Rayox	lb.	.14½	.15¼
Titanox A	lb.	.14½	.14¾
Titanox B	lb.	.05¾	.06
Titanox C	lb.	.05½	.05¾
Zinc Oxide—American Process [b]			
American Azo:			
ZZZ (lead free)	lb.	.07¼	.07½
Anaconda, lead free	lb.	.07¼	.07½
Horsehead Lead Free Brand:			
Special—3	lb.	.07¼	.07½
XX Red—4	lb.	.07¼	.07½
Kadox, black label—15	lb.	.07¼	.07½
Red label—17	lb.	.07¼	.07½
72	lb.	.07¼	.07½
St. Joe, black label	lb.	.07¼	.07½
green label	lb.	.07¼	.07½
red label	lb.	.07¼	.07½
U. S. P.—7, bbls.	lb.	.10½	.10¾
Zinc Oxide—French Process: [b]			
Florence White Seal—7 bbl.	lb.	.09½	.09¾
Green seal—8	lb.	.09	.09¾
Red seal—9	lb.	.08½	.08¾
Yellows [b]			
Cadmolith	lb.	.53	.60
Chrome	lb.	—	.50
Mapico	lb.	.071	—

[a] Price Ceilings.
[b] Price Suggestions or Agreements.

BLACKS
(In bags, carload lots)

Arrow Compact	.05¼	—
Atlantic	.05¼	—
Certified	.05¼	—
Continental	.05¼	—
Certified Spheron	.05¼	—
Disperso	.05¼	—
Dixiedensed	.05¼	—
Dixiedensed 66	.05¼	—
Excello	.05¼	—
Furnex	.03½	.06
Furnex Beads	.03½	.06
Gastex	.03½	.06
Kosmobile	.05¼	—
Kosmobile 66	.05¼	—
Kosmos-Dixie 20	.03½	.06
Micronex (Amarillo)	.05¼	—
Micronex Beads (Amarillo)	.05¼	—
Pelletex	.03½	.06
P-33	.04	.06½
Philblack A	.05	—
Sterling	.035	—
Supreme	.05¼	—
Thermax	.0225	.05
Wyex	.05¼	—

COMPOUNDING MATERIALS

Aluminum Flake	ton	18.00	24.50
99½%-300	ton	—	16.50
86-90%-300	ton	—	13.50
Asbestine	ton	16.50	20.00
Atomite	ton	—	27.50
Barium carbonate (98-100%)	ton	47.00	49.00
Barytes	ton	25.35	36.00
Bentonite	ton	11.00	16.00
Blanc fixe, dry	ton	60.00	67.00
Calcene	ton	37.50	43.00
Catalpo (fact)	lb.	.02	—
Clay, Aerfloted, Suprex	ton	11.00	23.50
Aerfloted Paragon	ton	10.00	22.50
Champion	ton	—	11.00
Crown	ton	—	11.00
Dixie	ton	11.00	23.50
Kaolloid	ton	—	9.00
Langford	ton	—	8.50
Magnolia	ton	—	10.00
McNamee	ton	10.00	22.50
Par	ton	—	11.00
Witco	ton	10.00	—
Kalite No. 1	ton	26.00	52.00
Kalvan	ton	100.00	126.00
Keystone white	ton	—	14.00
Magnesium carbonate	lb.	.06¼	—
Mineralite	ton	—	30.00
Pyrax A	ton	—	8.40
Rottenstone (powd. Dom.)	ton	25.50	37.50
Rubberol	lb.	—	.17½
Silene EF (calcium silicate)	lb.	.055	.06
Silical	ton	65.00	85.00
Snowflake white	ton	—	16.00
Talc, domestic	ton	14.50	—
Whiting, commercial	ton	16.00	26.00
Witco	ton	—	6.50
Witcarb R	ton	—	100.00
Witcarb R-12	ton	—	40.00
Wood Flour (100 mesh)	ton	30.00	32.00

MINERAL RUBBER

285°-300° Mineral Rubber	ton	25.00	27.00
Black Diamond	ton	25.00	—
Dielex	lb.	—	.06
Hard Hydrocarbon	ton	25.00	27.00
MilliMar	lb.	—	.05½

MISCELLANEOUS

Aromatics—Rodo #0	lb.	4.00	4.50
Rodo #10	lb.	5.00	5.50
Curodex 19	lb.	2.75	—
Curodex 188	lb.	3.50	—
Curodex 198	lb.	4.50	—
Para-Dors	lb.	4.50	—
Aresklene No. 375	lb.	.35	.50
Darvan (dispersing agent)	lb.	.30	.39
Santomerse S	lb.	.11	.25
Sponge Paste	lb.	—	.18
Sunproof	lb.	.22¼	.27¼
Tonox	lb.	.50	.59
Ty-Ply	gal.	6.75	8.75
Unicel (blowing agent)	lb.	.50	—

SOFTENERS

Acids			
Acetic, 28%, bbls.	100 lb.	3.38	3.63
Nitric, 36 degrees	cwt.	5.00	—
Acids, Fatty			
Laurex	lb.	.14¾	.17¼
SL-20	lb.	.11	.13
Stearex Beads	lb.	.10	.11
Stearite	lb.	.10	—
Alkalies			
Caustic Soda, 76%	cwt.	2.70	5.70
Soda Ash, 58%	cwt.	1.15	2.98
Oils			
Degras, bbls.	lb.	.10	.12
Para-Flux	gal.	.17	.18
Para-Lube	lb.	.046	.048
Petrolatum, amber	lb.	.03¼	—
Pigmentaroil, tank cars	gal.	.20½	—
in drums	gal.	.26½	.27½
Pine, tanks	gal.	.55	—
Rosin Oil, cmpd.	gal.	.40	—
Rubberol	lb.	.13½	.14
Rubtack	lb.	.10	—
Seedine, c.l.	lb.	.07¼	—
Witco Palm Oil	lb.	—	—
Witco Softener No. 20	gal.	.20	—
Woburn No. 8, c.l.	lb.	.06	—
Resins and Pitches			
Pitch, Burgundy	lb.	.08	—
coal tar	ton	19.00	22.00
hardwood	ton	16.00	22.50
pine, 200 lb. gr. wt.	bbl.	—	4.50
Pigmentar, tank cars	gal.	.20½	—
in drums	gal.	.26½	.27½
Retort Pine Tar, drums	gal.	.26½	.27½
Solvents			
Acetone, pure	lb.	.07	—
Benzene, 90%, tank car	gal.	.14	—
Beta-Trichlorethane	gal.	—	.20
Bondogen	lb.	.98	1.25
Carbon, bisulfide	lb.	05	.08¼
Carbon tetrachloride	gal.	.73	1.27
Dichlorethylene	lb.	—	—
Dipentene, cml., drums	gal.	.48	.50
Ethylene dichloride	lb.	.07½	.08½
Plastogen	lb.	.07¾	.12
Reogen (drums)	lb.	.11½	.15
Rub-Sol	gal.	.09½	—
Trichlorethylene	lb.	.08	.09½
Turpentine, steam dist., drums	gal.	.80	.83
Waxes			
Antisol	lb.	.22½	.23½
Beeswax, white	lb.	.58	—
Carnauba, yellow	lb.	.83¼	—
Ceresin, white, dom.	lb.	.13½	.15
Montan, dom.	lb.	.30	.35
Paraffin			
Yellow crude scale, 124/126	lb.	.04¼	—
Refined, 120/122	lb.	.05¼	—

ANTI-OXIDANTS

Agerite Alba	lb.	1.95	2.03
Gel	lb.	.52	.54
Hipar	lb.	.61	.63
Powder	lb.	.40	.42
Resin	lb.	.43	.45
Resin D	lb.	.40	.42
White	lb.	1.23	1.33
Albasan	lb.	.69	.74
Antox	lb.	.54	.56
B-L-E	lb.	.40	.49
Flectol H	lb.	.40	.47
Neozone A, C, D, E	lb.	.40	.63
Oxynone	lb.	.77	.90
Retardex	lb.	.44½	.47½
Santoflex B	lb.	.40	.47
Santoflex BX	lb.	.54	.61
Santovar O	lb.	1.15	1.40
S.C.R.	lb.	.32	.34
Stabilite	lb.	.48	.50
Stabilite Alba	lb.	.69	.74
VGB	lb.	.43	.52

EXTENDERS

Naftolen R-100	lb.	.10	.12

LUBRICANTS—MOLD & RUBBER SURFACE

Aresklene	lb.	.35	.50
Cocoa Soapstock	lb.	.06	.08
Colite	gal.	.90	1.15
Dipex	lb.	.06	.08
Glycerized Liquid Lubricant	gal.	—	1.35
Lubrex	lb.	.25	.30
Mineralite	ton	—	30.00
Sericite	ton	65.00	75.00
Soap Tree Bark, cut, sifted	lb.	.06	.08

FACTICE OR RUBBER SUBSTITUTES

Amberex	lb.	.25	—
Amberex Type B	lb.	.18¾	—
Black	lb.	.08½	.13
White	lb.	.09	.15
Brown	lb.	.10	.14
Neophax A	lb.	.16½	—

VULCANIZING INGREDIENTS

Dispersed Sulfur No. 2	lb.	.08	.12
Sulfur Chloride, yellow (drs.)	lb.	.03	.08½
Sulfur, rubber makers			
Refined (bags)	cwt.	2.55	—
Commercial (bags)	cwt.	2.20	—
Tellor	lb.	1.75	—
Vandex	lb.	1.75	—
Vultac No. 1	lb.	.38	.43
Vultac No. 2	lb.	.38	.41
Vultac No. 3	lb.	.42	.49

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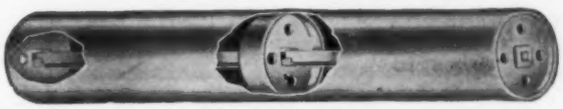

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RATES:
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8c per word in light face type—Minimum, $3.00
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Positions Wanted:
$1.00 for 40 words or less; extra words, 5c each.
When Box Number is used, add 5 words to word count.

If heading is to be set on separate line, count it as 10 words if light face type is used, or 8 words if bold type is used.
Display or Classified advertisements in borders: $10.00 per column inch; maximum, 85 words per inch.
All Classified Advertising must be paid in advance except for advertisers on contract. Send check with copy.
Replies to keyed advertisements will be forwarded to advertiser without charge.

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EXECUTIVES! Burdened with details? Trying to cut costs? Planning new departments? Having trouble finding right man? Here's the assistant you need: Economics degree. Administrative, analytical, statistical experience. Record of achievement positions requiring creative thinking, organizing ability, initiative, judgment. Accustomed to planning for new offices, activities. Specialist in business forms design, simplifying, systematizing, methods, procedures. Knows statistics, surveys, analysis, graphs. Can interpret, write reports. Not afraid of responsibility, hard work. Welcomes challenge of difficult, unusual tasks. Mastery of details if required. Address Box 2095, RUBBER AGE.

POSITION WANTED AS FACTORY MANAGER OR PLANT SUPERINTENDENT. Experienced in compounding, milling, calendering, extruding, and molding of all synthetic and rubber tires, tubes and mechanical rubber goods. Mechanical molded and extruded goods a specialty. Know cost and modern methods of processing. Can take complete charge of factory. Address Box 2106, RUBBER AGE.

HELP WANTED

CHEMIST with some compounding experience on soles and heels. Permanent position with large nationally known company. Outstanding opportunities for advancement. State age, education, experience, including previous and present employment, and starting salary desired. Address Box 2034, RUBBER AGE.

CHEMIST with experience in latex and solvent cements, also other types of adhesives. Plant located in Eastern United States is equipped with modern laboratory. Extra fine association with university trained management and staff offers you a most congenial atmosphere. Excellent opportunity for advancement. Write, giving age, education, and experience. Application will be held in strictest confidence. Address Box 2074, RUBBER AGE.

TIRE AND TUBE DEVELOPMENT AND CONSTRUCTION ENGINEERS—Excellent opportunity in progressive Eastern company. Unlimited opportunity for advancement. Salary commensurate with ability. Address Box 2091, RUBBER AGE.

SUPERINTENDENT for nationally known sole and heel manufacturing company. Unusual opportunity for right man. State age, education, where employed during past ten years and where employed at present, also starting salary desired. Address Box 2035, RUBBER AGE.

TIRE CURING FOREMAN—Must have experience and capability in supervising tire production. Permanent position with attractive salary for man with resourcefulness and ability. Eastern concern. Specify all qualifications first letter. Address Box 2092, RUBBER AGE.

PLASTICS CHEMIST, experienced in milling, calendering and spread coating operations for development work on simulated leathers, synthetic shoe soling and similar materials. Location: Wilmington, Delaware. Reply giving pertinent data on education, experience, references, and salary expected. Address Box 2097, RUBBER AGE.

OPENING FOR YOUNG MAN with some compounding and mill experience. Excellent opportunity for steady advancement in small rubber department, building and repairing printers' rubber rollers. State age, weight, experience, and salary expected. Located in New York City. Address Box 2102, RUBBER AGE.

TIRE FINISHING SUPERVISOR—Opening for man with experience in supervising duties connected with cured tire final finishing. Position offers excellent opportunity for advancement. All replies confidential. Address Box 2093, RUBBER AGE.

CHEMICAL RESEARCH DIRECTOR. New York City firm affords an unusual opportunity to a thoroughly experienced administrator to take full charge of its industrial research laboratory and staff of research and control chemists. We seek a man with outstanding executive ability and extensive experience with rubber, rubber synthetics, resins, plasticizers, solvents, adhesives. A sound knowledge of patent problems is desirable. State salary requirements for first year's demonstration of ability; subsequent increases depend on our finding the right man. Address Box S3, 50 EAST FORDHAM ROAD, NEW YORK 58, N. Y.

CHEMIST for formulating and research work on Pyroxalin, Vinylite and other types of flexible coatings. Must be familiar with application of these coatings to rubber, cloth, or paper and also be able to perform sales service duties. Address Box 2107, RUBBER AGE.

TUBE ROOM SUPERINTENDENT OR FOREMAN—Must be capable of supervising all tube room operations. Opening offers unlimited opportunity for man of experience and capability. Progressive Eastern concern. All replies strictly confidential. Address Box 2094, RUBBER AGE.

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INDEX TO ADVERTISERS

A

Adamson United Co. 681
Adhesive Products Corp. 696
Advance Solvents & Chemical Corp. ..... ——
Akron Standard Mold Co. 755
Albert & Son, L. 765
American Cyanamid & Chemical Corp. ..... ——
American Viscose Corp. 670, 671
Ameriacn Zinc Sales Co. 686
Angier Products Co., Inc. ..... ——
Atlas Electric Devices Co. ..... ——

B

Baker Castor Oil Co. 691
Baker Chemical Co., J. T. 757
Barrett Div., Allied Chemical & Dye Corp. 688
Barrett, Richard C. 759
Beacon Co. 747
Berlow & Schlosser Co. 765
Binney & Smith Co. ..... Insert Following 732
Bonwit, Eric ..... ——
Brockton Cutting Die & Machine Co. ..... ——

C

Cabot, Godfrey L., Inc. 673
Caldwell Co., The ..... ——
Cameron Machine Co. ..... ——
Carter Bell Mfg. Co., The 758
CLASSIFIED ADVERTISING 764, 765
Cleveland Liner & Mfg. Co. ..... Back Cover
Columbian Carbon Co. ..... Insert Following 732
Connor, Charles F., & Co., Inc. 763
CONSULTANTS SECTION 765
Continental Carbon Co. 684
Continental Machinery Co. 749
Continental-Mexican Rubber Co. ..... ——

D

Dow Corning Corp. 662
Du Pont de Nemours & Co., E. I. ..... Inside Front Cover

E

English Mica Co. 761
Erie Engine & Mfg. Co. 747

F

Firestone Tire & Rubber Co. 655
Flintkote Co., The 667
Franklin Research Co., Inc. 756

G

Gammeter, W. F., Co. 763
Gardner-Richardson Co. 697
General Aniline & Film Corp. 748
General Atlas Carbon Co. 658
General Chemical Co. 677
General Latex & Chemical Corp. 668
General Magnesite & Magnesia Co. 757
Genseke Brothers 656
Gidley, Philip Tucker 765
Goodrich, B. F. Chemical Co. (Chemicals) 652
Goodrich, B. F., Chemical Co. (Geon) ... 651
Goodrich, B. F., Chemical Co. (Hycar) .. 649
Goodrich, B. F., Chemical Co. (Reclaims) —
Goodyear Tire & Rubber Co. 657
Gordon-Lacey Chemical Products Co. 661

H

Hall Co., The C. P. 689
Hardesty Chemical Co., Inc. ..... ——
Hercules Powder Co., Inc. 678-679
Heveatex Corporation 745
Hoggson & Pettis Mfg. Co. ..... ——
Holliston Mills, Inc. 690
Howe Machinery Co., Inc. 763
Huber, J. M., Inc. 700
Hydraulic Press Mfg. Co. 753

I

Independent Die & Supply Co. 745
Industrial Oven Engineering Co. 763
Industrial Rayon Corp. 659

J

Jacoby, Ernest & Co. 761
Johnson Corp., The 753
Johnson, S. C., & Son, Inc. ..... ——

K

Kroma Chemical Co. ..... ——

L

Littlejohn & Co., Inc. ..... ——
Loewenthal Company ..... ——
Ludlow-Saylor Wire Co. ..... ——

M

M. & N. Machine & Tool Works 763
Magnetic Gauge Co. ..... ——
Marbon Corp. ..... ——
Market Forge Co. ..... ——
Mercer-Robinson Co., Inc. 749
Metallurgical Service Co. 761
Meyer & Brown, Inc. 757
Meyercord Company ..... ——
Monsanto Chemical Co. 695
Moore & Munger ..... ——
Mt. Vernon—Woodbury Mills, Inc. 663
Muehlstein & Co., H., Inc. 672
Mumper, James F., Co. 765

N

National Lead Co. 692
National Rosin Oil & Size Co. 761
National Rubber Machinery Co. 674
National Sherardizing & Machine Co. ... 763
National-Standard Co. ..... ——
Naugatuck Chemical, U. S. Rubber Co., (Chemical Div.) 702
Naugatuck Chemical, U. S. Rubber Co., (Latex & Lotol) 675
Neville Co. ..... ——
New Jersey Zinc Co. 660
New Wrinkle, Inc. ..... ——

O

Olin Laboratories, The R. R. 765

P

Pancorbo, M. ..... ——
Pennsylvania Industrial Chemical Corp. ..... ——
Pequanoc Rubber Co. 664
Phillips Petroleum Co. 650
Pittsburgh Corning Corp. ..... ——
Pittsburgh Plate Glass Co., Columbia Chemical Div. ..... ——
Powdered Material Research Labs. 765
Precision Scientific Co. ..... ——
Preventive Maintenance Co. 755
Proctor & Gamble 751
Protective Coatings, Inc. ..... ——

R

Rand Rubber Co. 763
Randall, Frank E. Co. 755
Rare Metal Products Co. 763
Rayon Processing Co. of R. I., The 752
Reconstruction Finance Corp. 682, 698
Renfrew & Kuffler 765
Resinous Products & Chemical Co. ..... ——
Revertex Corp. of America 747
Robinson Mfg. Co. 749
Rohm & Haas Co. ..... ——
Royle & Sons, John 753

S

St. Joseph Lead Co. 676
Schrader's Son, A. ..... ——
Schulman, A., Inc. ..... Inside Back Cover
Scott Testers, Inc. 744
Sharples Chemicals, Inc. 699
Shell Oil Co., Inc. ..... ——
Simplex Cloth Cutting Machine Co., Inc. 751
Sinclair-Collins Co. 761
Skelly Oil Co., Solvents Div. ..... ——
Snell, Foster D., Inc. 765
Southeastern Clay Co. ..... ——
Spadone Machine Co. ..... ——
Stamford Rubber Supply Co. 766
Stanco Distributors, Inc. 685
Stanco Incorporated ..... ——
Standard Chemical Co. 669
Standard Oil Co. (Indiana) 746
Stanford Engineering Co. 754
Stauffer Chemical Co. 751
Stearns Magnetic Mfg. Co. 763
Sun Oil Co. 687

T

Tanney-Costello Co. ..... ——
Textile Proofers, Inc. 750
Thropp & Sons, William R. 745
Titanium Pigment Corp. ..... ——
Triplex Tool-Die-Mold Making Co. ..... ——
Turner Halsey Co. 663

U

Union Bay State Chemical Co. 680
Union Pacific Railroad 694
United Carbon Co. ..... Insert following 664
United Engineering & Foundry Co. ..... ——
U. S. Rubber Reclaiming Co. 654
U. S. Stoneware Co. ..... ——
Utility Mfg. Co. 759

V

Vanderbilt, R. T., Co. ..... Front Cover

X

Waldron Corp., John 759
White Products Co., J. J. 749
Whittaker, Clark & Daniels, Inc. 693
Williams, C. K., & Co. 763
Wilmington Chemical Corp. 653
Witco Chemical Co. ..... Insert following 682

W

Xylos Rubber Co. 655

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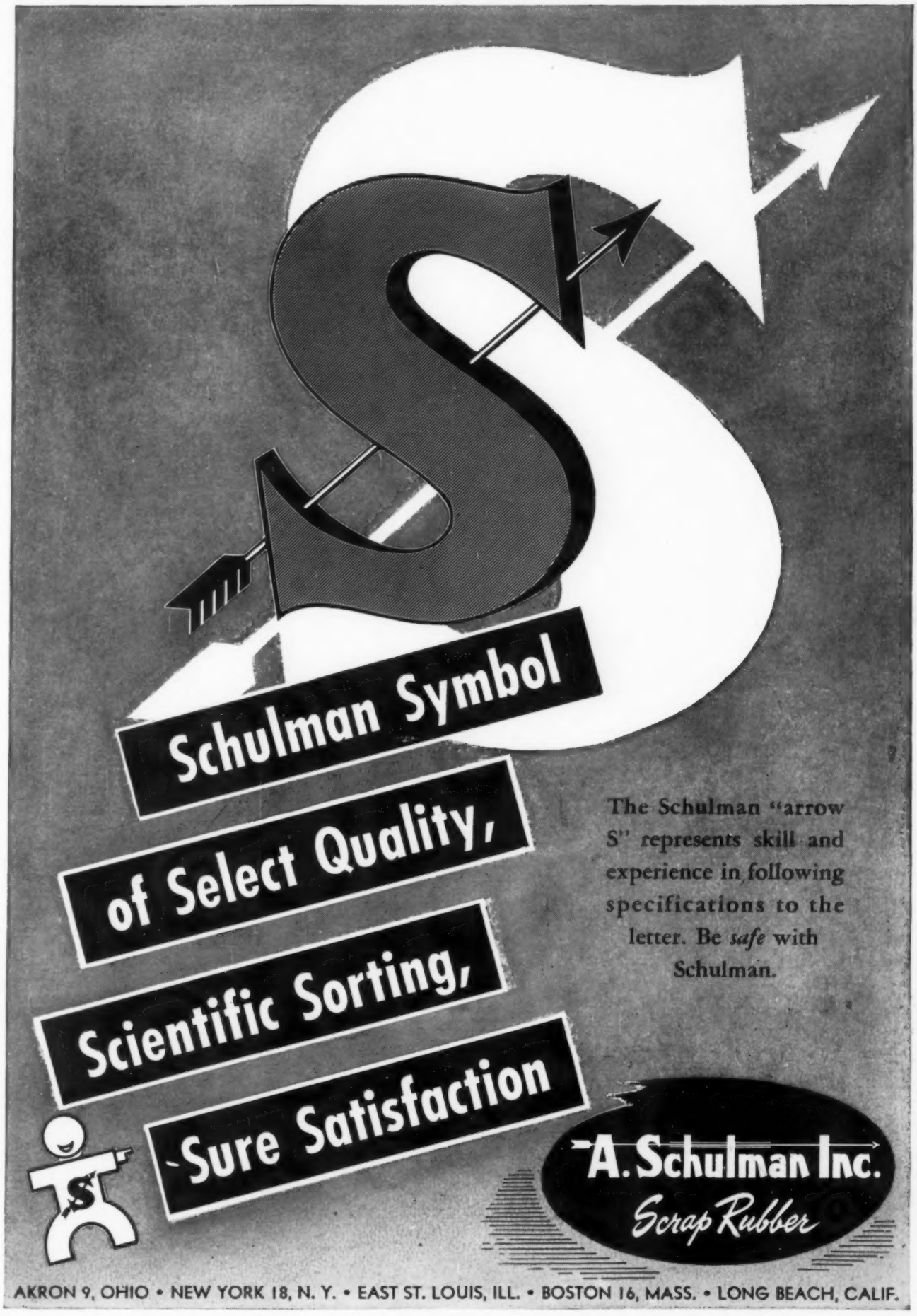
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